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INTERNATIONAL FIRE PROTECTION

THE GLOBAL VOICE FOR PASSIVE & ACTIVE FIRE PROTECTION

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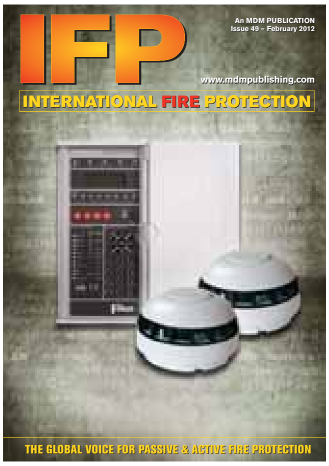

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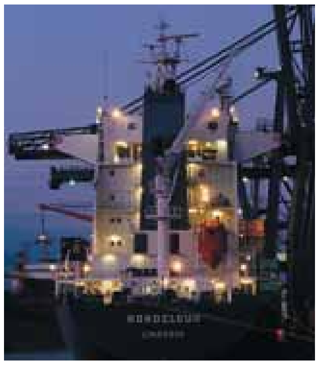
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Total Life

When putting together this edition of International Fire Protection I was struck by how many times contributors referred to the importance (or sometimes the overlooking) of total life cost when making purchasing decisions in the fire protection industry.

Of course, the expression comes in several guises, such as: total lifetime cost; lifetime ownership cost; in-use cost; and cost of ownership – you can choose your own permutation of the words, but the intent of the meaning is the same in each case. It is about getting the potential buyer to see beyond the cheque he or she is signing right now and focus on the price that will ultimately be paid when a host of hidden or unforeseen costs are totted up over the period of time the product or system is in use – energy costs, maintenance, replacement part costs, unreliability or lack of durability and the like.

In the economic troubled waters that we all seem to be sailing in at the moment (although there are those fortunate few who are able to watch from the shore) selling the total life cost concept must be pretty daunting. For too many businesses, today's survival can so easily trump tomorrow's saving. But all power to their elbows because hidden in the bowels of this cost equation argument is an important issue that impacts on us all – sustainability. Any products or services that, for example, reduce energy usage (and that includes the energy expended in manufacturing replacements for prematurely worn out products) or makes fewer demands on our dwindling material resources is at the very least worth taking seriously.

But total life cost has another meaning, particularly in this industry that has as its clear primary concern the saving of lives from the ravages of fire; a meaning that any potential purchaser should take to heart when getting a little too myopic about the quote or tender that has landed on the desk. The cost that he or she is about to agree to is all about an individual's or group of individuals' lives; their very safety and wellbeing. So, perhaps before dismissing too hastily a potential supplier's total life cost arguments, stop to consider fully the merits of the argument.

Be as sure as possible that the lower initial purchase price bid about to be chosen does not have a tragic total life cost for somebody else; someone who has every reason to believe or suppose that their safety was the overriding concern when the decision was made. Depending on the nature of the business in question that may include fellow employees, customers, visitors and passers-by. Not forgetting of course the fire and rescue service personnel who – some time down the line perhaps – may well be called upon to risk their lives when a fire got out of hand due to a past-its-best detection system or a seen better days suppression installation.

Be sure that the lower initial purchase price does not have a tragic total life cost for somebody else; someone who has every reason to believe or suppose that their safety was the overriding concern when the decision was made.

It is a difficult call for any purchaser to make; one that it is nigh on impossible to get right without the wisdom of hindsight. This is particularly so in instances where companies rely on using the term total life cost without convincingly spelling out to potential customers what the cost equation will look like over, say, a five, ten or 15 year period. How is the purchaser to do the maths; surely only the supplier has the necessary information or can make the best educated assessments?

Whichever way, one thing should be a shared goal for all of us in the industry. Let us make sure that we strive to safeguard total life, and not lives that are cut short prematurely. IFP

Legacy Mains Voltage Manual Call Points

The latest addition to KAC's range of manual call points for specialist applications is the MCP6V, an indoor call point for flush or surface mounting that will switch up to 2A at 240 volt AC mains voltage. While the overwhelming majority of fire systems in Europe and around the world operate at 24 volt DC, there are a significant number of legacy mains voltage systems still in commission. These are located primarily in the Far East or in countries that have recently joined the EU, and they require continuing support for routine maintenance and replacement of devices.

The MCP6V is a specially terminated unit fitted with a mains voltage micro-switch. Externally identical in size and user interface with the normal low voltage version, it features warning signs, visible when the operating cassette is removed, to alert installers and service engineers to the presence of high voltage. The internal layout of the unit has been designed specifically to minimise any opportunity for inadvertent contact with the terminals.

The product is tested and approved by LPCB (Loss Prevention Certification Board) to EN54-11: 2001 (Fire detection and fire alarm systems. Manual call points).

For more information, go to www.kac.co.uk

Extra Protection for Composite Panels

A new fire protection system launched by PROMAT UK is claimed to offer a retrofit solution for the upgrade of existing foam-filled composite panel applications and delivers either 60-minute or 120-minute fire protection.

Composite panels generally feature metal outer skins bonded to an insulating core that can be made from expanded polystyrene (EPS), extruded polystyrene (XPS), polyurethane (PUR), polyisocyanurate (PIR), mineral wool (MMMF) or foamed phenolic. They represent a lightweight, cost-effective solution for exterior wall and roof applications, as well as for internal walls and ceilings linings in temperature controlled environments such as clean rooms. However, Promat points out, fire performance can vary widely between different types of panel, according to the type of core material, the fixing methods used and the joint design chosen

The Promat Promaclad system is said to offer a solution to this problem for wall constructions up to 10 metres high. It can be installed over the existing panels with minimal disruption and adds an extra fire-resistant layer that ensures that the panels are kept well below the auto-ignition temperature of the core material. It also represents a cost-effective and environmentally positive alternative, as the original panels are left in place and do not need to be disposed of.

For more information, go to www.promat.co.uk

Protection Technology Upgrade

WAGNER UK has launched a new high-performance version of its OxyReduct Compact system, allowing the fire protection technology to be applied cost-effectively to even more mission critical applications where any business interruption is unacceptable or where the warehouse stock or archive is invaluable. It creates an environment where fire cannot start, by continuously reducing the oxygen level in a closed room through adding nitrogen to the air. The oxygen is reduced to a level in which most combustibles do not inflame and an open fire is impossible. Importantly, people can enter and work in the protected area at any time.

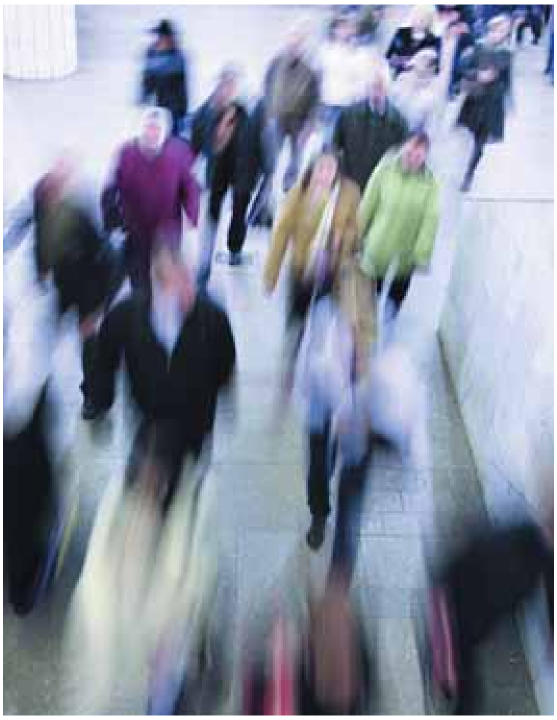
OxyReduct Compact is a self-contained nitrogen control and production system that can be installed remotely or within the protected area. This latest version has double the nitrogen production capacity and can be installed in rooms up to 1500 cubic metres. The system is said to be quiet in operation, require little maintenance and only calls for supply and exit pipes, oxygen sensors and an alarm system in order to be fully operational.

Over 500 major organisations throughout Europe, have already installed OxyReduct systems in applications including IT data centres, communication suites, archives, museums, cold/freezer storage and warehousing.

For more information, go to www.wagner-uk.com

New Crowd Simulation and Evacuation Software

The UNIVERSITY OF GREENWICH has released the next generation of its evacuation and crowd simulation software called buildingEXODUS, created by the university's Fire Safety Engineering Group. This latest release – known as Version 5.0 – has new capabilities that will enable building engineers to perform the most realistic desktop simulations that have ever been possible, predicting not only how individual people interact with each other and the built environment, but also how they can be debilitated by hazards such as heat, smoke and toxic gases.



Version 5.0, draws extensively on data and experience captured from experiments and real-life incidents. Its human behaviour 'submodel' includes rules governing the often complex behaviour of people affected by smoke in fire situations and the use of signage in an emergency. It also examines the psychological aspects governing how, and why, people select an escalator or an adjacent staircase as their escape route.

Since its launch in 1996, the buildingEXODUS package has been used by engineering consultancies, architects, research laboratories, regulatory authorities, police forces, fire brigades and universities in 37 countries. The package has also been used to model the evacuation capabilities of a wide range of proposed or existing buildings and crowd situations, from the Love Parade disaster analysis to the Beijing Olympics, and from the World Trade Centre investigation to the Statue of Liberty redevelopment. The software is used in design analysis for underground stations, high-rise buildings, hospitals, shopping complexes, school buildings, museums, theatres, airport terminals, sports stadia and external crowd events; virtually any type of situation involving the gathering or movement of people.

For more information, go to http://fseg.gre.ac.uk/

Visionary Panel

C-TEC has introduced a new multi-loop Envision touch-screen controlled analogue fire panel.

Fully compliant with EN54 parts 2 and 4, Envision's high-integrity network can accommodate up to 128 nodes (panels) and over 10,000 programmable and indicatable detection zones. The panel's 110mm, 472 x 248 pixel colour resistive touch-screen has been designed to provide clear and constant feedback on all aspects of fire alarm system activity, and the on-screen QWERTY keyboard makes programming and installation straightforward.

For more information, go to www.c-tec.co.uk

IP Approval for Hydrogen Sulfide Gas Detector

DET-TRONICS has announces that its nanotechnology metal oxide semiconductor hydrogen sulfide gas (NTMOS H2S) detector has earned approval for use in locations that require an ingress protection rating of IP66/67. The rating was achieved as a result of the detector's robust mechanical design and indicates that the gas detector is protected against dust and forceful water during operation. The ingress protection filter and guard protect the detector in tough offshore situations and are fully replaceable in the field.

The new certification joins a list of other previously obtained approvals and certifications for the NTMOS H2S gas detector, including CE (Conformité Européene or European Conformity), CSA International, ATEX, IECEx, FM tested and certified to ISA-92.0.01. The NTMOS boasts a speed-of-response performance that detects H2S in six seconds (T20).

For more information, go to www.det-tronics.com

BSI Joins European Fire and Security Group

The British Standards Institution (BSI) has been granted membership to the European Fire and Security Group (EFSG), which means manufacturers within the fire and security sectors can now gain product certifications from a sole provider that is internationally recognised.

This new membership will save BSI clients time and money by reducing the need for duplicate testing, as BSI's test reports for fire alarm system standards (EN 54) will now be recognised by other EFSG members. Manufacturers should also be able to bring their products more quickly to market.

EFSG is a group of certification bodies that aims to establish a common approach to product certification in the fire and security sectors, including commercial fire products such as smoke and heat detectors, control panels and power supplies.

For more information, go to www. bsigroup.com

New Ordinary Hazard Sprinkler

VIKING CORPORATION has introduced what it claims to be the industry's first quick response, extended coverage, flat plate concealed fire sprinkler for Ordinary Hazard (OH) occupancies. The new VK538 Mirage sprinkler, which is cULus Listed for OH-1 and OH-2 occupancies, provides in these applications "the enhanced aesthetics of a flat cover plate with the design advantages of a QREC sprinkler."

With a K Factor of 11.2 (161), the VK538 is suited for systems requiring higher water densities, as well as situations where the available water pressure is limited. Potential applications being cited by Viking include casinos, hotel atriums, retail environments, libraries, automotive showrooms, and shopping malls.

The VK538 Mirage is Listed for coverage areas as large as 6.1 metres by 6.1 metres and has required flows and pressures that are less than or equal to most non-concealed sprinklers for OH occupancies. The new sprinkler has a 20 mm NPT thread size and is available in 74°C and 96°C temperature ratings. They are available in several standard finishes and a nearly unlimited number of custom colours.

For more information, go to www.vikingcorp.com

New High-output Sounder/Beacon

NITTAN has extended its range of audio visual fire products with the new Evolution EV-HIOP-SB(IC) sounder/beacon. It is said to provide a "simple and highly cost-effective solution" to meeting disability discrimination requirements by providing both sound and flashing light to alert occupants to a fire.

Features claimed for the new device include ease of installation and IP65 ingress protection rating as standard. It comes with 16 alarm tones to choose from and individually-controlled alarm and alert tones, allowing users to choose a combination that works for any installation. The sounder/beacon is designed to be wall mounted.

For more information, go to www.nittan.co.uk

Tanks Get the Green Light

BALMORAL TANKS' glass reinforced plastic and steel sectional tanks, as well as its range of cylindrical steel tanks, are all now Loss Prevention Certification Board (LPCB) approved for the storage of sprinkler system water storage. They hold up to 1.3million litres of water and are built to achieve a service life of at least ten years.

For more information, go to www.balmoral-group.com

Raising the Bar

FIKE is claiming that its new LPCB-approved TwinflexPro fire alarm control panels are "setting new standards for versatility, convenience and value in two-wire fire protection systems" with features that include an integrated event log, a key switch control access facility, a wide range of delay functions and a convenient PC setup option.

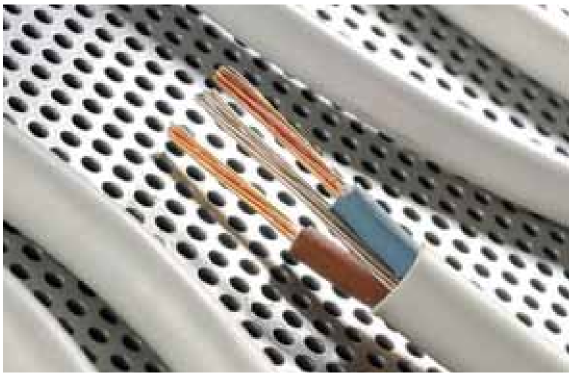
The new panels are targeted at small and medium-sized applications, such as private hotels, guest houses and homes of multiple occupation. They allow detectors and sounders to share the same wiring to simplify installation and reduce cost. The new panels are available in two-zone, four-zone and eight-zone versions, with support for up to 32 devices in each zone. All sizes of panel share the same enclosure, and four-zone panels can be upgraded to eight-zone in the field.

TwinflexPro panels feature an integral data log that stores information for up to 500 alarm and fault events. The information can be recalled to the panel's LCD display or downloaded to a PC, making it easy to investigate the sequence of events leading to alarm activations. The data log also aids maintenance and fault finding. When silencing or resetting an alarm, the new panels have provision for enabling control access with a key, as well as by entering a code.

The new panels provide two monitored outputs that can be configured as conventional sounder circuits, a feature that makes the panels well suited for use when upgrading existing conventionally wired installations. A delay function is also incorporated, which can be applied to any output. Setup can be performed either from the front panel or via a standard PC.

For more information, go to www.fike.com

New Cable Offering



PRYSMIAN has launched a new cable range. Called Afumex, it is designed to be used in place of the standard PVC cabling that according to the company can be hazardous in the event of fire. Prysmian says that in the early stages of a fire, the primary danger is not flame but toxic gas, citing a report on fire prevention by the Swedish Rescue Services Agency that has shown that lethal conditions can arise in buildings as quickly as three minutes after fire breaks out, with most deaths due to being overcome by gas or smoke.

Afumex cables – which includes Afumex 6491B, Afumex 6242B, Afumex BS6742 and Afumex LSX – are low smoke zero halogen, flame retardant cables that meet or exceed the cable construction standard, the low smoke standard, the zero halogen standard and the flame retardant standard. Afumex is resistant to ignition and flame spread, producing very low levels of smoke and virtually no acidic gases when burnt.

For more information, go to www.afumexcables.co.uk

Cable Underpins Airport Fire Safety

DRAKA has been chosen to supply fire-rated cable for critical life and property protection applications at Birmingham Airport in the UK This, the company says is the latest phase of a relationship between Draka and the airport that has resulted in Draka cable being specified across the airport complex, which has recently undergone a £100 million redevelopment.

Draka's involvement with the airport began during the construction of the second terminal – originally called The Euro Hub – that was opened in 1991 and was the first terminal in the world that combined both domestic and international passengers. This terminal has now been merged with the airport's Terminal One into a new "One Terminal". Today, the airport experiences just short of ten million passenger movements a year.

The latest installation of Draka cable provides a secure power supply to the airport's sprinkler fire suppression control system, and utilises Draka's Firetuf FTP120 fire-resistant power cable. This is an OHLS – Halogen Free Low Smoke – 600/1000V SWA (steel wire armoured) power cable that meets the rigorous requirements of BS 8491:2008.

Draka says that this particular cable was chosen because of its ability to maintain the essential circuit integrity when exposed to fire and flame. It achieves the 120-minute fire resistance rating of BS 8519:2010 and meets the specified requirement of the constructional standard of BS 7846:2009

For more information, go to www.drakauk.com

Steelguard Thin-Fi

PPG Protective & Marine Coatings (PPG) is a world leader in the development and manufacture of high-performance protective coatings to protect steel and concrete structures from fire and corrosion for a wide range of global industries. As a leading PPG product range, all the Steelguard products have been specifically formulated to provide the most effective protection for steel structures from cellulosic fire, with unique properties that help to save lives and protect assets across the world.

Within the Steelguard range we offer complete systems of intumescent coatings for various fire protection ratings and climatic exposure conditions that comply with many national standards. As we will see, there are a number of factors that affect the right choice for a fire protection coating solution.

Specification of Thin-film Coatings

With the continual development of fire protection product technology, thin-film intumescent coatings are increasingly being specified and applied on a wide range of projects. In addition to new product development, the introduction of the European Standard EN 13381-8 for passive fire protection systems, and the demand for international certified coatings systems, has resulted in a more selective use of intumescent coating systems. Products meeting European, as well as national standards, offer protection in line with future construction requirements.

Projects can vary, from high-rise residential and commercial buildings, where the steelwork will – in the majority of cases – be enclosed in a C1 dry internal environment, to industrial plants and swimming pools, which are classed as C4 corrosion conditions (based on the ISO 12944 standard). Moreover, harsher environments have constant high humidity and aggressive atmospheres, which make fire protection using thin-film intumescent coating a more difficult proposition.

In any environment other than dry internal C1 conditions, a protective topcoat is required to prevent moisture or chemicals attacking a thin-film intumescent coating. These coatings are designed primarily for their fire protection properties and not as corrosion or weathering products. Because of this the intumescent, when applied to the steelwork, can be prone to attack from chemicals and water, which is why their use in the construction industry is currently, in the majority of cases, limited to C4 corrosion environments with appropriate topcoat protection.

It is the engineer's responsibility to specify the appropriate coatings to ensure construction integrity, corrosion protection, weathering resistance, fire resistance and appropriate decorative finish.

Optimal products must be selected with regard to their individual performance aspects such as weld-ability and corrosion resistance throughout the construction period for a pre-construction primer. With the correct product selection and system combinations, the corrosion resistance and weather stability of both the steel primers, as well as the intumescent coatings, must be ensured.

Let us take a look at Steelguard in action on a major installation, which required detailed and specific coating performance criteria.

The Great Tank of Maritime and Coastal Engineering

Institute of Environmental Hydraulics: University of Cantabria

The Great Tank is located in a purpose-built structure at the Institute of Environmental

For further information, go to www.ppg.com

Im Coatings

Typical Intumescent Systems Differentiated To ISO 12944 Corrosion Classes				
Environment ISO 12944	**Application**	**Primer**	**Intumescent**	**Topcoat**
C1	On-site	Epoxy Zinc Phosphate 75 µm dft	Solvent or water-based products	Optional requirement
C2	On-site	Epoxy Zinc Phosphate 100 µm dft	Solvent or water-based products	Acrylic **or** Polyurethane at 60 µm dft
External C3/C4	On-site	Zinc epoxy 75 µm dft **or** Epoxy Zinc Phosphate 125 µm dft	Solvent-based products	Acrylic **or** Polyurethane at 120 µm dft
C1	Off-site	Epoxy shop primer	Solvent or water-based products	Acrylic or Polyurethane 25 µm dft at 60 µm dft
C2	Off-site	Epoxy Zinc Phosphate 100 µm dft	Solvent or water-based products	Acrylic **or** Polyurethane at 60 µm dft
External C3/C4	Off-site	Zinc epoxy 75 µm dft **or** Epoxy Zinc Phosphate 125 µm dft	Solvent-based products	Acrylic or Polyurethane at 120 µm dft

Hydraulics at the University of Cantabria, Spain. The Institute (IH Cantabria) is responsible for the management of the facility, and is a joint research centre founded by the University of Cantabria and the Environmental Hydraulics Institute Foundation.

The tank itself measures 44 metres wide, is 30 metres long and ten metres deep, and holds 5.5 million litres of water. Because of its enormous size it can simulate a wide range of wave conditions, up to a height of six metres. As well as wave research, the €27 million facility also allows researchers to focus on other key areas of interest, such as materials engineering, renewable energy and electronic engineering.

The Steelguard Solution

The construction requirements and building legislations specified a thin-film passive fire protection system that would meet all construction work conditions.

With a 60-minute fire rating required, and the steelwork exposed to a C4 corrosive environment, the coatings contractor selected PPG in Spain to recommend its best coatings option for this challenging project. The Steelguard 562 60-minute, thin-film, solvent-borne intumescent coating was chosen. Its ease of application, additional weather resistance capabilities during the construction phase, as well as its extremely competitive thicknesses being decisive factors in its selection.

In order to protect the steelwork in C4 conditions, a full three-coat PPG fire protection system was necessary to ensure that the intumescent would not be susceptible to chemical or moisture attack. This system consisted of a leading PPG brand as the anticorrosive primer, €100,000 of Steelguard 562 for the fire protection, and another product as the approved protective topcoat for the intumescent.

Steelguard – The Superior Solution for Cellulosic Fire Protection

PPG'S expertise in fire protection coatings has been achieved through decades of proven performance in a wide of hostile environments.

The development of Steelguard thin-film intumescent coatings started in the mid-1980s, when the companies first started to market and develop intumescent coatings in the UK, in cooperation with British Steel. With the formulation of external-grade intumescent products and matching application innovations in the development of off-site applied intumescent coatings, PPG demonstrates its proactive commitment to solving the challenges of the construction industry. These coatings are ideally suited for today's designers and provide an extremely smooth surface. The excellent aesthetic finish of the intumescent coating allows the architect flexibility to specify a range of PPG-approved protective and decorative topcoats to enhance the visual appearance of the exposed steelwork.

A Total, Customer-focused Solution

The industry constantly faces new demands, which is why we work closely with our customers and the world's leading architects and engineers to continually improve the value and effectiveness of all our fire protection products. This drive and pursuit of excellence delivers coatings that are unsurpassed in performance and protection among asset owners, contractors, fabricators and applicators across the globe, and helps customers meet the challenges they face today, and tomorrow.

Steelguard thin-film intumescent coatings can be specified for any number of different environments as part of a complete fire protection system. Working closely with PPG, engineers can tailor a fire protection specification to their own specific needs, thereby assuring clients of the guaranteed longevity and performance expected from the system.

Experience, innovation and integrity – that is what makes PPG the ideal coatings partner. IFP

Louise Jackman

BRE Global

Kevin Annablen

BRE Global

Watermist Fire Suppression Systems

– for Commercial Low-hazard Occupancies

Watermist fire protection systems are fire suppression systems that have emerged as an alternative fire safety solution for specific applications over the past few decades – but are they suitable for commercial low-hazard occupancies?

A watermist system is a fire suppression system that, when activated, will discharge a spray of water droplets from a nozzle (or array of nozzles). The sizes of watermist droplets will typically be smaller than those discharged by traditional sprinkler systems. A system may operate automatically when nozzles are exposed to a sufficiently high level of heat to activate a frangible glass bulb or solder link contained in a nozzle.

Some systems can be linked to a detection system and use open nozzles, while other systems can be manually operated. The system will comprise a number of components to provide a water reservoir, water pressurising system and pipework to deliver water to spray out from the system nozzle/s. Different watermist systems operate at different system pressures between about 3-bar and 100-bar or more. Watermist systems can suppress fires by wetting, cooling and through localised oxygen displacement (by conversion of water droplets into steam in the flame zone).

Background

In the UK and elsewhere, watermist systems are increasingly being considered and used for the fire protection of buildings, including offices, hotels and other commercial premises. Watermist is seen as an exciting new technology by many in the fire

industry and systems may also offer additional environmentally attractive design. However, for those responsible for specifying systems, approving building designs and insuring properties, there is a challenging lack of relevant, independent advice and information on their suitability.

Watermist systems for protection against the damaging effects of fires come in a multitude of different shapes and sizes. Historically, different systems have been tested and demonstrated to be effective against a number of specific applications. A few examples include their use in cabins on board ships, in machinery spaces or for specific localised protection of objects. There are further examples of effective watermist systems tested for the protection of small rooms (such as hotel bedrooms, prison cells or domestic dwellings).

The mechanisms for successful watermist operation in a fire event and the variables that influence the effective performance of systems – where the volume of the compartment is limited – have now become well established through many testing and research programmes.

Watermist systems will typically discharge significantly less water than traditional sprinkler systems. For many applications this is an advantage both in terms of the design requirements of the system and the reduced potential for water damage in the event of a system operation. However, what is critical is that the ability of a system to tackle a fire using less water is not compromised. For large open spaces where there may be significant quantities of combustible material, the suitability of watermist protection needs to be carefully assessed.

Third Party Certification

Due to the diversified nature of watermist systems and their many bespoke designs it has been a great challenge to standards writing authorities and third-party certification bodies across the world to establish suitable standards and certification schemes. This has led to a loosely regulated installation history for watermist systems and often, a lack of confidence in their fire suppression performance.

To address this issue, The Loss Prevention Certification Board (LPCB) in the UK will be publishing a Loss Prevention Standard (LPS 1283) and certification scheme for the approval and listing of watermist systems for use in commercial low-hazard occupancies. The scheme will support and augment the requirements of DD 8489 'Fixed Fire Protection Systems – Industrial and Commercial Watermist Systems'. In addition, LPCB also intends to establish a watermist system installer scheme (LPS 1284).

Manufacturers and suppliers will be able to undertake LPS 1283 to verify the components and design methodology of their watermist system. Installers of the manufacturer's watermist systems will be able to undertake LPS 1284 to verify their competency for design, installation and maintenance. End users of watermist systems will be responsible for the on-going maintenance of systems and in particular maintenance of the building fire load and fire hazard classification consistent with the watermist system design. This will mean it is necessary for the 'Responsible Person' under the Regulatory Reform (Fire Safety) Order, 2005 in the UK and more broadly anyone responsible for fire safety in buildings, to conduct a fire risk assessment and ensure compliance with the specified criteria of the certified system.

As stated previously, critical to the successful operation of a watermist system are the system design details. Of equal importance are the building design details – the fire loads, obstructions, ventilation, ceiling height, compartmentation and openings in the protected space. These design details need to be fully addressed in both the fire performance tests and installed systems to ensure their effectiveness. Therefore, the LPCB certification scheme will contain restrictions with respect of floor area (for certain systems), ceiling height, ventilation, fire load density, fire growth rate, height of combustibles and obstructions. The development of this Loss Prevention Standard was underpinned by a programme of research by the BRE Trust as explained below.

Experimental Programme

The BRE Trust has recently funded a three-year watermist research programme, supported by industry partners. The programme included large

scale fire tests conducted by BRE Global at its Burn Hall laboratory near Watford in the UK.

To assess the performance of watermist systems, three key experimental tasks were undertaken:

1 A series of single wood crib fire tests to evaluate the influence on the effectiveness of the watermist system fire suppression capability of; water flow/pressure, nozzle position in relation to fire position, obstructions, ventilation and compartmentation.
2 Development of a full scale fire test protocol for commercial low-hazard occupancies based on a 'stylised' office fuel loading.
3 Testing of a sprinkler system and industry provided low and high pressure watermist systems to establish their performance against the developed fire test protocol.

Key Findings from the Research

1 From the series of tests with a single wood crib, it was demonstrated that, for the specific conditions tested:
   - The position of the fire in relation to the position of the watermist discharge nozzle was critical to the fire suppression effectiveness of the spray, even within the nominal area of coverage provided by the nozzle.
   - The presence of shielding, that is an obstruction in the direct path of the water spray to the fuel source, resulted in reduced suppression effectiveness.
   - Ventilation flows detrimentally affected the performance of the watermist suppression and influenced the fire growth characteristics.
   - Watermist flow rate/pressure and ceiling height can influence the effectiveness of the suppression provided by a system.
   - For otherwise equivalent situations, the watermist system tested was more effective when tackling a fire in a compartment than in open conditions.

2 In the development of the full scale test protocol an assessment was made of typical open office areas. Information was gathered and reviewed from an office survey, office fire load surveys, office fire test data and standard test fires. A 'stylised' office scenario was arranged consisting of two combustible walls, a chipboard table with foam sheets, cardboard and paper loading and with two wood cribs (but also containing plastic material) beneath the table top.

   The scenario met the following criteria:
   - The fuel loading was representative of a commercial low-hazard occupancy, fire growth rate and heat release rate.
   - It was a challenge to a watermist system with a shielded fire source and open ceiling.
   - The materials were closely specified, easily sourced and could be repeatedly obtained. The scenario was simple and relatively cost effective.
   - The arrangement allowed for clear system 'pass/fail' criteria to be developed.

3 In the full scale tests carried out, the results were as follows:
   - The sprinkler system, operating at a water coverage density of five mm/min provided effective fire suppression.
   - All the watermist systems demonstrated lower temperatures at ceiling level and reduced fire damage compared to a 'baseline' unsuppressed fire 'freeburn'.
   - However, the low pressure watermist system at a nozzle spacing of three metres by three metres did not provide effective suppression of the fire and did not meet the test criteria.
   - The high pressure watermist system (installed on a three-metre and four-metre spacing) did not provide effective suppression of the fire and did not meet the test criteria.
   - A low pressure system, tested at a spacing of 2.5 metres by 2.5 metres and a water coverage density of five mm/min (equivalent to the sprinkler system coverage) did suppress the fire and meet the test criteria successfully.

   The scope of the testing was necessarily limited and other system arrangements may perform differently.

Conclusions

Overall, the full-scale test results were of concern. A significant number of watermist system arrangements were not able to provide expected levels of fire protection for the tested scenario (open plan area with obstructed fire loads and a high ceiling). In terms of the design of the tested systems, in many instances, the spacing between nozzles was too great and the quantity and momentum of water discharged too low to provide effective fire suppression. The test work demonstrated that watermist system effectiveness cannot be assumed and that it is essential to verify system performance against realistic, reliable and repeatable fire test protocols.

Output

A report titled "Watermist fire protection in offices: experimental testing and development of a test protocol", published by IHS BRE Press (FB 34), provides the detailed results from the research carried out. The report describes the experimental study and provides fire test evidence to assist in the understanding of watermist systems.

The test protocol has now been adopted by the British Standards Institute and forms part of a recently published watermist draft for development standard in the UK, DD 8489 'Fixed fire protection systems – Industrial and commercial watermist systems'.

Summary

For many in the fire industry, watermist systems will continue to offer an alternative to more traditional systems. The progress being made now has the potential to result in robustly tested and certified watermist systems for low-hazard commercial premises. This will help to provide confidence to authorities having jurisdiction, building owners and insurers that a watermist system is suitable for the intended application to which it is being installed. IFP

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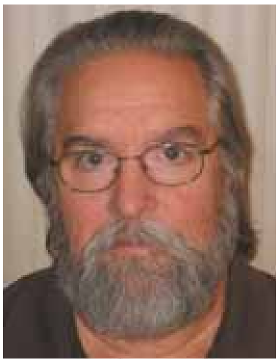
BRE Trust is a charitable company in the UK. Its objectives are through research and education, to advance knowledge, innovation and communication in all matters concerning the built environment for public benefit. As a charity for research and education, the BRE Trust commissions 'for public benefit' research from the BRE Group of companies and elsewhere. The Trust is the largest UK charity dedicated specifically to research and education in the built environment.

Climate Change an Clean Extinguishin

Dubai Metro. Protected by FM-200



Mark L. Robin

DuPont Chemicals & Fluoroproducts

No other issue related to the hydrofluorocarbon (HFC) clean fire extinguishing agents is perhaps more misunderstood than the issue of their environmental impact.

This confusion in the clean agent marketplace results from a lack of understanding of three key issues. Each requires reviewing in detail and provides factual information related to the use and environmental impact of HFCs in fire suppression applications. The three issues are:

1 The meaning of global warming potential (GWP) values.
2 The impact of HFCs used in fire suppression on climate change.
3 Regulations related to HFCs in fire suppression applications.

Background

Since their introduction in the early 1990s, the HFC-based clean agents have been the most widely employed replacements for Halon 1301 worldwide, and there are currently hundreds of thousands of HFC-based fire suppression systems installed worldwide, protecting billions of dollar's worth of valuable and sensitive assets. The HFC-based clean agents employed in total flooding applications are FM-200 (CF_3CHFCF_3, HFC-227ea), FE-25 (CF_3CF_2H, HFC-125), and FE-13 (CF_3H, HFC-23).

Table 1 (below) shows a small sample of some of the facilities and equipment protected by HFCs. Major corporations employing HFC-based fire protection include Cisco, Westinghouse, Etisalat, Sprint, Lockheed Martin, Exxon/Mobil, AT&T, GTE, Nokia, Saudi Aramco, Intel, IBM, Mitsubishi and Wal-Mart.

The success of HFCs in the clean agent market is due to the fact that the HFCs offer the best overall combination of the properties desired in a Halon 1301 replacement, along with being the most cost effective replacements. All HFCs are characterised by zero ozone depletion potentials (ODPs), and hence they do not contribute to ozone depletion. As can be seen below, the impact of HFCs employed in fire suppression applications on climate change (global warming) is minuscule, rendering the HFCs a viable, sustainable replacement for Halon 1301 in total flooding fire suppression applications.

d the HFC-Based g Agents

Table 1. Examples of HFC Clean Agent System Installations

Facility
National Museum of Pre-History, Taiwan
Eiffel Tower, France
Royal Thai Family Silk Museum, Thailand
Bangkok International Airport, Thailand
Smithsonian Institute, USA
US EPA Supercomputing Center, USA
Alexandria Library, Egypt
Dubai International Airport, UAE
Dubai Metro, UAE
King Saudi University, Saudi Arabia
Bouabieh Palace, Riyadh, Saudi Arabia
Aristoteles Museum, Greece
Dusseldorf International Airport, Germany

What are GWP Values, and What Do They Mean?

A clear explanation of what GWP values are can be found in Section A.1.6 of the recently published (2012) edition of NFPA 2001 Standard on Clean Agent Fire Extinguishing Systems, which demonstrates the fact that the GWP value considered by itself does not provide an indication of the impact of an agent on climate change, stating: "It is important to understand that the impact of a gas on climate change is a function of both the GWP of the gas and the amount of gas emitted. For example, carbon dioxide (CO_2) has one of the lowest GWP values of all greenhouse gas emissions (GWP=1), yet emissions of CO_2 account for approximately 85% of the impact of all greenhouse gas (GHG) emissions."

The GWP value for a gas simply compares the impact on climate change of the emission of the gas to that of CO_2. For example, a GWP value of 100 indicates that the emission of 1 kg of the gas in question has the same impact on climate change as the emission of 100 kg of CO_2.

Impact of HFCs in Fire Suppression Applications

The relative contribution or impact of any GHG to climate change is readily found from an examination of the number of the "CO_2 equivalents" associated with the amount of gas emitted. CO_2 equivalents are calculated by multiplying the mass of agent emitted by its GWP value, and are typically expressed in terms of "Tg of CO_2 equivalents," which can be calculated by multiplying the mass of emissions (in Tg) by the GWP of the gas in question.

Factual information related to the impact on climate change of HFCs in fire suppression applications is available from several independent sources. The US EPA (Environmental Protection Agency) has employed its vintaging model to estimate the emissions of greenhouse gases from various sources, and the most recent results are shown in Table Two and Table Three, which indicate the relative impact of GHG emissions (Tg of CO_2 equivalents) for the various GHGs and for HFCs as a function of industry, respectively.

Table 2. Relative Impact of GHG Emissions on Climate Change

Gas		USA
	Tg CO_2 equivalents	% of Total
CO_2	5505.2	83.0
CH_4	686.3	10.3
N_2O	295.6	4.5
HFC	125.7	1.9
PFC	5.6	0.1
SF_6	14.8	0.2
Total	**6633.2**	**100%**

Source: US EPA 430-R-11-005 (2011)

Table 3. Relative Impact of HFC Emissions on Climate Change

Gas		USA
	Tg CO_2 equivalents	% of Total
Refrigeration	104.9	83.5
Aerosols	9.1	7.2
Fire Protection	0.8	0.6
Foam	3.9	3.1
R-22 Manufacture	5.4	4.3
Solvents	1.3	1.0
Semiconductor Manufacture	0.3	0.2
Total HFC	**125.7**	**100%**

Source: US EPA 430-R-11-005 (2011)

As can be seen from Tables Two and Three, the impact (in Tg of CO_2 equivalents) of HFC emissions from fire suppression applications represents 100 x (0.8/6633.2) = 0.012% of the total impact of all GHGs. That is, the impact of HFC emissions from

fire protection applications represents approximately 0.01% of the impact of all GHG emissions.

Recent results from the HFC Emissions Estimating Program (HEEP), which estimates the emissions of HFCs from fire suppression, are in agreement with the results of EPA's vintaging model results for the emission of HFCs from fire suppression applications. The HEEP analysis also indicates that the emissions of HFCs from fire suppression applications have been steadily decreasing since 2007. The clean agent industry has done an excellent job of policing itself and reducing unnecessary discharges through its adherence to the Voluntary Code of Practice (VCOP) for the Reduction of Emissions of HFC & PFC Fire Protection Agents, a partnership of the U.S. EPA, Fire Equipment Manufacturers Association (FEMA), Fire Suppression Systems Association (FSSA), Halon Alternatives Research Corporation (HARC) and National Association of Fire Equipment Distributors (NAFED).

Emissions data is also available for EU-15 countries, and are summarized in Table Four and Table Five [Annual European Union GHG Inventory 1990-2009 and Inventory Report 2011, 27th May 2011]. As is the case for US emissions, the EU-15 data indicates that the relative contribution of HFCs in fire suppression applications to climate change is minuscule; 100 x (2.6/3729) = 0.07% of the impact of all GHG emissions.

Table 4. Relative Impact of GHG Emissions on Climate Change

	EU-15	
Gas	Tg CO_2 equivalents	% of Total
CO_2	3063	81.5
CH_4	311	9.0
N_2O	280	7.7
HFC	66	1.6
PFC	2	0.1
SF_6	6	0.1
Total	3729	100%

Table 5. Relative Impact of HFC Emissions on Climate Change

	EU-N15	
Gas	Tg CO_2 equivalents	% of Total
Refrigeration	50.1	75.9
Aerosols	7.6	11.5
Fire Protection	2.6	3.9
Foam		
R-22 Manufacture		
Solvents	5.7	8.6
Semiconductor Manufacture		
Total HFC	66.0	100%

Regulation of HFCs in Fire Suppression Applications

The Montreal Protocol relates to ozone depleting substances (ODSs), and not to zero ODP agents such as the HFCs, hence, HFCs are not subject to the provisions of the Montreal Protocol. The Kyoto Protocol and F-Gas Regulations are related to the reduction of GHG emissions, but are solely concerned with emissions reductions and do not limit or prohibit the use of HFCs in fire suppression applications. Regulators understand the science as illustrated above; they understand the minuscule impact of HFC emissions associated with fire suppression.

With regard to the regulation of any chemical, no one can guarantee a lack of future regulations, and speculation on this point serves only to confuse the industry and drive end users to non-clean alternatives such as sprinklers. No one can guarantee that HFCs in fire suppression applications will

never be phased out — not without being able to divine the future.

Can anyone guarantee that perfluoroketones will not be phased out in the future? Unlike other clean agents, perfluoroketones are characterised by high chemical reactivity (for example, hydrolysis when crossing the lung-air interface, cf. Novec 1230 Fire Protection Fluid Safety Assessment, 3M). Even the inert gases have been challenged by acoustic damage, high cylinder pressures, and room over-pressurization. Regulations continuously evolve as new science, information, and issues develop in the marketplace, and no product is immune to a changing regulatory future.

It is a fact, however, that with regard to regulations, HFCs in fire suppression applications are being treated differently than HFCs employed in other applications. Emissions of HFCs from fire suppression applications are dwarfed by HFC emissions from other applications such as refrigeration. Regulatory bodies understand this, and to date HFCs in fire suppression applications have been subject to different sets of regulations. A good example is the F-Gas regulation in Europe, which has adopted, supported and regulated good industry practices around system filling, handling, and servicing of fire systems.

It is important when encountered with an assertion of impending legislative or regulatory action related to HFCs in fire suppression applications to always request two items:

1 A copy of the legislation

2 The location of the text that is specifically related to HFCs in fire suppression applications.

Eiffel Tower. Protected by FM-200

F-22 Raptor. Protected by FE-25

This will avoid confusing specific targeted information with broader market relevance, or extrapolating an action in one target sector to another entirely different sector, such as fire suppression. The two following examples from a recent article (Asia Pacific Fire Magazine, October 25, 2011) exemplify these risks.

In the article it stated that: "It has been reported in the National Academy of Sciences that if nothing changes, HFC emissions are likely to be equivalent to between 9 to 19 percent of global greenhouse gas emissions by 2050." This statement refers to the report, "The Large Contribution of Projected HFC Emissions to Future Climate Forcing," Velders, et. al., Proc. Nat. Acad. Sciences, (106), 27, page 10949. The article specifically relates to HFCs used in refrigeration, air conditioning and insulating foam production where emissions dwarf those of HFCs from fire suppression applications. The report further indicates that HFC-227ea was not even included in the analysis due to its small use and emissions. The article supports the case for the use of alternative technologies and emission reduction schemes for highly emissive HFC uses, but offers no analysis or comment on the use of HFCs with respect to fire suppression.

Based on US EPA data, the impact of HFC emissions from fire protection applications represents approximately 0.01% of the impact of all GHG emissions.

The same article also refers to a petition to the US EPA to delist acceptable SNAP substitutes: "In May 2010, the US EPA received a petition to selectively remove HFCs from the list of acceptable substitutes under the EPA's Significant New Alternatives Policy Program (SNAP). This move could have a large impact on the fire protection sector…" The US EPA received the petition from the National Resources Defence Council (NRDC) in May of 2010. The petition is a request to remove a single HFC, HFC-134a, from the list of acceptable substitutes for CFC-12 in motor vehicle air conditioning systems maintained under EPA's Significant New Alternatives Policy (SNAP) program, and to remove HFC-134a from such list in any other end-use category (for example, aerosols and stationary refrigeration) where more benign alternatives are available. Specifically, this was not a petition to "selectively remove HFCs" from the SNAP list, but a petition to remove one, highly emissive compound from specific refrigeration applications, for which the user industry was already moving to adopt a viable alternative. Before addressing the original petition, the EPA required the petition to limit the scope to new mobile air conditioning applications in new passenger cars and light duty vehicles only, and is now just beginning a process to determine whether such a transition can occur. Stakeholder input is currently being assessed, and there has, to date, been no decision as to whether or not such a transition will occur in this specific market sector and application. As such it is puzzling to see it asserted that this petition could in some fashion affect the clean agent fire suppression industry.

Conclusion

Factual information related to the impact on climate change of HFCs in fire suppression applications is available from several sources, and this data demonstrates that the impact of HFC clean agents on climate change is minuscule. As a result, HFCs are expected to remain viable, sustainable, and environmentally acceptable replacements for Halon 1301 well into the foreseeable future. IFP

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We're raising the bar.
Again.
34.5
25
bar
North America
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Africa

Pic courtesy of iStockphoto

Critical Factors in Evacuation Strate

William E. Koffel

Koffel Associates

A hospital fire on 9th December 2011 resulted in at least 89 deaths in Kolkata, India. A fire in a drug rehabilitation centre in Lima, Peru on 28th January 2012 resulted in at least 27 fatalities. Reports from both fire incidents describe attempts by the responding fire service personnel to rescue the patients or residents inside the facility. It has also been reported that facility staff may not have implemented procedures necessary for the safe escape or rescue of the patients/residents in the two facilities. Both of these incidents highlight the need for proper emergency procedures regarding the evacuation, relocation or defend in place for building occupants.

NFPA 550, Guide to the Fire Safety Concepts Tree, provides tools to assist a fire safety practitioner in communicating fire safety concepts and methods. The Fire Safety Concepts Tree provides an overall structure to analyse various fire safety concepts or strategies. In this instance, NFPA 550 will be used to analyse various strategies to manage the exposed and more specifically the occupants of a building.

Using the Fire Safety Concepts Tree one can evaluate the effectiveness of limiting the occupants that are exposed to the fire or safeguarding the occupants who are exposed to a fire. Most designs incorporate a combination of the two strategies. Limiting those that are exposed to the fire is typically done by compartmentation, possibly by defining a maximum area or occupant load for a fire compartment or smoke compartment. The intent of this article is to highlight the critical factors associated with various evacuation strategies and therefore the concept of limiting the number of occupants exposed will not be further explored in this article.

Occupant Evacuation or Relocation

The first step in evacuating or relocating occupants is to provide a means by which movement is caused. This is done by detecting the fire, signalling the need to move, and providing instructions for the occupants.

The fire event may be detected by manual or automatic means and the means by which the fire is presumed to be detected is often regulated by prescriptive building and fire codes or by the performance design. The same codes or design approach will then determine the threshold for which a fire alarm system is required based upon occupancy classification, number of occupants, or height of the building. In those buildings for which the code or the design approach does not require a fire alarm system, there is a presumption that a means exists by which the occupants will be

Determining
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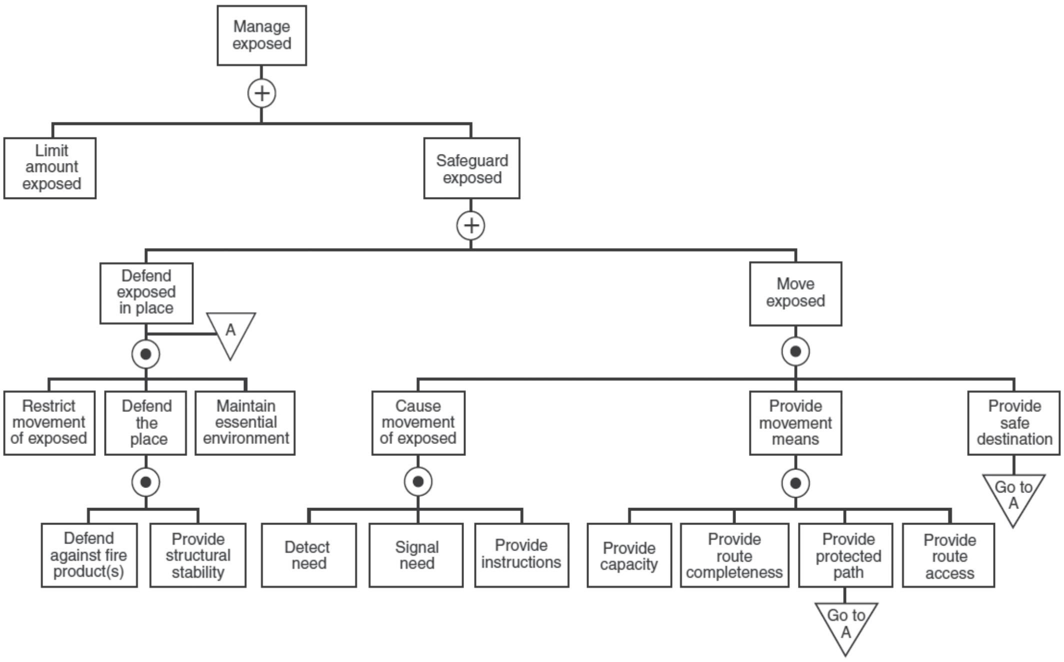

"Manage Exposed" Branch of Fire Safety Concepts Tree

notified. In the instances where a fire alarm system is not provided, one would hope that the design professional has communicated this to the building owner to ensure that proper emergency procedures will be in place to alert the occupants when movement is necessary.

Another critical decision that should be made during the design process is whether the movement is to be a general evacuation of the entire building or a partial evacuation of those who are likely to be impacted by the fire event. When partial evacuation is the selected strategy, the design of the fire alarm system is often referred to as selective notification. Many building codes limit the application of this strategy to high-rise buildings, although the approach should be applicable to any building in which total evacuation is not practical or desirable. When partial evacuation is used, consideration must also be given to the strategy that was previously mentioned, limiting those that are exposed. In this instance, the design should consider the means by which the fire and the effects of the fire are likely to be contained to the area of the building that is proposed to be evacuating, thereby minimising the need for evacuation of other areas of the building.

Modern codes and standards also address how the need to evacuate is to be communicated to the building occupants. For example, NFPA 72, National Fire Alarm Code, has required the use of a standard evacuation signal for all fire alarm systems installed after 1st July 1996. The signal is referred to as a distinctive three-pulse temporal pattern and has been adopted as both an American National Standard (ANSI S3.41, American National Standard Audible Emergency Evacuation Signal) and an International Standard (ISO 8201, Audible Emergency Evacuation Signal). The intent is to provide a signal that will clearly be recognised by all building occupants as a signal to evacuate or relocate due to an emergency within the building. There has also been considerable research conducted regarding the effectiveness of voice communication as compared with other means to notify occupants of the need to

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evacuate. Lastly, modern codes and standards also address the need for both audible and visible notification means and the required performance (audibility, intensity, location) of the alarm notification appliances.

Providing instructions for the occupants who are to evacuate or relocate is also compounded when partial evacuation is used. Common practice often involves providing an evacuation signal to cause movement by the occupants in certain areas of the building while a message is also communicated to the remaining occupants that a fire emergency has been reported in the building and that while there is no immediate need for them to evacuate, they should remain on alert. In modern society, one can anticipate that cell phones or media coverage will result in occupants in other areas of the building becoming aware of the fire event within the building. By not providing proper instructions to all building occupants, those who have not been given instructions, but now find out about the fire incident, will be left to wonder what they are to do.

Once movement has been initiated, the next aspect of the strategy to evacuate or relocate is to provide an effective egress path.

Building codes typically provide a prescriptive methodology to determine whether the egress capacity is adequate for the occupant load anticipated in the building or areas to be evacuated. Alternative methods and performance-based approaches often result in the use of computer models to evaluate the required egress time. The use of egress models requires a detailed

discussion well beyond the limits of this article but the users of such models and those that evaluate the use of such models need to fully understand the assumptions made by the model and the safety factors that are used in the calculations. Unfortunately, humans will not always respond in the most effective and efficient manner during a fire emergency and as such, human behaviour needs to be factored into any calculation of required egress time. This consideration includes what is commonly referred to as pre-movement decision making (such as deciding whether to evacuate or not).

During the time required to evacuate, an accessible and protected path most be provided for the occupants. The egress paths should also be recognisable by the building occupants, which can be problematic in those occupancies in which the occupants may not be familiar with the building, in those occupancies in which the occupants' abilities may be impaired (possibly due to the consumption of alcohol), and in those occupancies in which other design considerations result in not wanting to make the egress routes easily identifiable. For example, how easily identified are the egress routes from many mercantile or retail establishments?

The use of egress models requires a detailed discussion well beyond the limits of this article but the users of such models and those that evaluate the use of such models need to fully understand the assumptions made by the model and the safety factors that are used in the calculations.

Other design considerations, such as security, often impact the usability of the egress path by the building occupants. In a perfect world (from a fire safety perspective), every building occupant would have access to at least two, remotely located egress paths that are usable without the use of any keys, tools, special effort or special knowledge. Building and fire codes typically offer prescriptive solutions to address these risk factors based upon the occupancy classification and the assumed characteristics of the occupants. Mathematically, this approach is typically referred to as the available safe egress time (ASET), which needs to be greater than or equal to the required safe egress time (RSET). It must be understood, however, that both ASET and RSET can change dramatically over a given set of reasonably credible fire scenarios.

It should be recognised that merely causing the occupants to leave the building does not provide a complete egress path to a safe location. The occupants need to have the ability to egress to a safe

Pic courtesy of iStockphoto

destination. While not common, the structural collapse that occurred during the World Trade Centre incident is a clear example of why merely causing people to evacuate to the exterior of a building is not always adequate. A common approach to this issue is to provide a means by which the occupants can egress to a street or public way that can then be used to move further away from the building if necessary.

Defend In Place

It is not always practical or desirable to expect that the occupants are going to evacuate or relocate. For example, in a hospital the "evacuation strategy" may be to minimise the need to relocate patients and instead, defend the occupants in place. When discussing evacuation or relocation, it is noted that there was a need to cause the occupants to move. When a defend in place strategy is employed, there is a need to safely restrict movement. In a hospital or a prison, this may be less complicated because the occupants are typically not capable of self-evacuation. However, when a defend in place strategy is used, a means needs to be provided by which the occupants are instructed not to evacuate or relocate.

In many occupancy types, staff is used to prevent the movement of the occupants. When this is done, some of the same procedures that are used to cause movement are required to alert the staff to implement the emergency procedures. These include detecting the fire, notifying the staff of the fire event, and then providing instructions, in most cases prior to the fire, by staff training and preparedness, as to how to implement the emergency plan.

During the time period that the occupants are to remain in place, the fire safety strategy must result in maintaining a tenable environment for the building occupants. There is not a consensus among fire safety engineers as to what constitutes a tenable environment and it is probably impossible to define a single set of criteria that could be used to define tenability for all types of building occupants. For example, should different criteria be used to determine tenability for a hospital as compared to an industrial occupancy? The Society of Fire Protection Engineers sponsors an international conference every two years (the next one is in Hong Kong in June 2012) at which this issue is typically discussed and presentations from various countries will utilise varying tenability criteria.

In addition to maintaining a tenable environment, it is also critical to maintain structural integrity for the anticipated duration of the reasonably credible fire scenarios. This concept is demonstrated in the Life Safety Code®, NFPA 101®, in which minimum building construction types are provided for health care occupancies but not for business occupancies. The Code is anticipating the use of a defend in place strategy or a hospital and an evacuation strategy for a business occupancy.

Summary

Unfortunately, recent fire experience has demonstrated the need for proper consideration of evacuation strategies during the design and operation of buildings. While many simple buildings can easily employ an evacuation strategy that requires total and immediate evacuation, most complex buildings use either a strategy of partial evacuation/relocation or a combination of defend in place and partial evacuation/relocation. Using the concepts identify in the Fire Safety Concepts Tree, the article highlights some of the key design and operational considerations for each of strategies that could be used. For a discussion as to how much of this is incorporated into a modern code, one should refer to the Life Safety Code, NFPA 101-2012, Annex Note A.4.8.2.1(3). A read only version of NFPA 101-2012 can be accessed by going to www.nfpa.org/101. IFP

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Fire & Blast Prote
Value Assets

The consequences of a high-value asset fire demand a fit-and-forget containment solution

Sean Appleton

Promat UK

High value assets come in many different types, shapes and sizes but each creates a very real need for reliable and effective passive fire protection. Fire and blast protection systems have an important role to play in helping building owners and designers provide that protection.

In today's high-security world there are many different types of asset that can be classed as high value, with power generation plants, chemical and oil storage depots and many types of defence facilities being obvious candidates. There are also other less obvious contenders, including hospitals, transport infrastructure buildings, museums and business premises such as data storage centres and financial establishments. In short, any building or facility that has the potential to cause major disruption or financial loss if taken out of service can qualify as a high value asset. The need to keep these assets in service and operating normally make it essential that they each have the most appropriate and reliable type of protection from fire and blast.

If anyone was to doubt that need, the latest Annual UK Fire Loss Statistics, published by the UK Home Office, should convince them. They indicate that the UK suffers annual fire related losses of £1,300 million just in terms of property, and a further £200 million to cover business interruption costs.

While there are various potential causes of a major blaze in a high value asset, fires often follow as a consequence of an initial explosion. Oil and gas facilities have suffered well-documented losses, but we should also remember that the hazardous environments that exist inside some industrial buildings, such as paper mills and flour mills, often contains organic dust that can contribute towards an explosion if not managed properly. The devastating consequences that can be created by an explosion and a resulting fire mean that there is an on-going requirement for a complete fit-and-forget containment system that can be relied on to perform, even under the most extreme conditions.

To understand why such a fire and blast protection system is required for this type of situation, it is worth examining the processes involved in a typical blast and blaze incident. Some types of explosion subject the surrounding environment to an instantaneous huge pressure wave that can cause enormous damage in its own right. This is usually followed immediately by a wave of reverse, negative pressure that can be equally damaging. Other explosions can add shrapnel-like fragmenta-

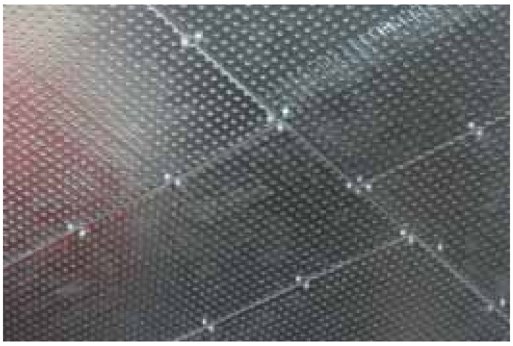
ction for High

tion into the bargain – where pieces of the explosive container are projected at great speed across the explosion zone. Alternatively, an explosion that is incendiary in nature will allow intense heat to be emitted at a rapid rate, thus creating a different set of hazards that need to be contained. It is obvious then that the first requirement for any fire protection board is to be able to offer a high level of containment to any or all of these blast effects, even before its fire-protection abilities are called into question.

A common misconception exists surrounding the ability of block-work walls to resist high levels of impact and blast pressure. A standard 150mm dense block work wall will fail under a 4000J impact due to the weakness of the mortar joints. Similarly, relatively low levels of blast pressure will destroy a shear block wall (1–2psi) and shear solid 225mm brick walls (7–8psi). For comparison, it is estimated that the blast that destroyed the Piper Alpha oil platform in 1988 measured between 10.7 and 14.3psi.

In contrast, a barrier system such as, for example, the Promat Durasteel system will maintain its integrity following a 180-minute fire test and 4000J impact. A similar system has also been successfully blast tested up to 33.8psi overpressure, and does not require the associated foundation work or design footprint of block-work walls. Durasteel is a composite panel of fibre-

A high performance system will suffer little or no damage from everyday exposure



Composite panels of fibre-reinforced cement, mechanically bonded to punched steel sheets on both sides, can deliver the required strength and resistance

reinforced cement, mechanically bonded to punched-steel sheets on both outer surfaces, which allow it to deliver the strength and resistance required to withstand high impact and blast pressures. The fibre-reinforced composite core panel enables the board to deliver the type of fire protection that allows it to be classed as 'non-combustible' to BS 476: Part 4: 1970 and A1 to Clause 10 of BS EN 13501-1:2002.

In the event of a fire, such a system will resist both the blast and the fire, maintaining the all-important compartmentation, which is an essential element in protecting any construction that houses a high value asset. This type of system should be able to resist damage from falling debris during the fire itself, while afterwards, the inherent strength of the board can also help the building to remain stable and secure until remedial work can be carried out. In addition, it will contribute only minimal amounts of smoke or gas, and provide good acoustic insulation performance.

As might be expected, this type of advanced, high performance system will suffer little or no damage from everyday exposure. This makes such systems well suited to use on many different types of high value installation, and their use in many thousands of projects across the world have proven their ability to withstand extremes of temperature, demanding and hostile environments, plus the type of severe thermal shock caused when high pressure water hoses are used to fight a fire. In short, such systems can provide virtually maintenance-free 'fit-and-forget' solutions with a design life in excess of 40 years.

Walls, doors and ceilings can all be protected by these types of high performance barrier systems. Normally designed to fit onto a framework, they can be used to create a wide variety of bespoke layout options and this generally enables the chosen system to meet the specific requirements of individual projects. The fire wall systems that are created can be used to separate and shield hazardous areas, protect escape routes, construct refuge areas and create fire compartmentation systems within buildings and storage areas.

Such a system can also be used to create stand-alone barriers for applications where damage must be limited by preventing the blast and the fire

Even non-critical assets such as transformers can offer enormous potential for fire-related destruction

from spreading between different areas via a "domino" effect. When used in this mode – as opposed to being built-in to the building's structure – the board can be used to create barriers designed to meet most of the generally recognised fire curves and it is normally certified by many approval bodies including Underwriters Laboratories, Factory Mutual and Lloyds. Its relatively light weight can also generate significant savings in terms of space, installation time and costs, as simpler and smaller foundations can be used compared with traditional poured concrete or concrete block barriers.

This is a particular benefit for retrofit applications where space can often be limited and the fire protection must be installed without disturbing any existing services or facilities. The installation process is also a "dry" trade, which minimises the possibility of disruption to other trades working in the same areas, so allowing faster project completion. Barriers constructed from Durasteel for example can usually be demounted and reinstalled, which greatly simplifies any maintenance work or refurbishment tasks that need to be completed.

The effectiveness of this type of fire and blast barrier system – and its ability to provide genuinely bespoke protection for virtually any installation – is reflected by the ever-growing list of recent projects where they has been used. In the UK alone, that list includes high values assets such as the London Underground, Heathrow Airport's Terminal 5, plus numerous Ministry of Defence and energy projects. There are also numerous projects that may not have the same security prominence but where reliable protection is still required, such as the British Museum and the new Westfield London retail project.

It is worth remembering that even non-critical assets can derive real benefits from the installation of an effective, high performance fire and blast protection system. Equipment such as power transformers are a common, everyday sight and can frequently be found located adjacent to commercial and industrial buildings. However they offer enormous potential for injury and destruction as they contain large quantities of oil and also carry high voltages – a volatile combination even at the best of times. This is one of the key reasons today's insurers and corporate risk managers often consider power transformers to be one of the most critical electrical components in a building, and this factor is driving the current demand for increasingly effective fire and blast protection boards to be used for this type of equipment installation.

It makes perfect sense for anyone involved in the specification process to give themselves a significant advantage by seeking advice from a specialist manufacturer of fire and blast systems. They will be able to draw on many years of practical experience to provide accurate and reliable advice and help create the most appropriate fire protection solution for the project in question. They should also be able to support that guidance by offering a full portfolio of third-party accredited solutions for fire compartmentation, structural steel protection and fire stopping applications. And remember, the earlier the manufacturer is given the opportunity to become involved in a project, the easier it is to arrive at a cost-effective solution that does not compromise on performance.

Fire protection is an area where designers, fire engineers and building owners simply cannot afford to take any chances, and this applies particularly to high value assets. The devastating effects of an incorrect specification are obvious to all concerned, making it imperative that the right products for the task are teamed with expert advice and guidance. Only in that way can we be sure that our high value assets will go on performing whenever we need them to. IFP

Systems should resist falling debris, and help the building to remain stable after the fire until remedial work can be carried out

Sean Appleton is Marketing Manager at Promat UK

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Graham Ellicott

Fire Industry Association

Responding to Automatic Fire Alarm Signals

When Government research points to attendance at automatic fire alarm signals, my question is: why are the fire and rescue services opting to reduce attendance to them?

Quoting the UK's Department for Communities for Local Government's newly published: Fire Statistics Great Britain, 2010 – 2011: "there were 337,300 false alarms attended in 2010-2011, a decrease of five percent from 2009-2010 and one third lower than the peak level of 507,000 in 1995".

The number of false alarms is obviously still far too high, but not as high as you might have been led to believe by England's Fire and Rescue Services. In many cases they have now withdrawn or greatly reduced attendance to automatic fire alarm (AFA) signals to which it is not possible to confirm a real fire with a 'call back' from the alarm receiving centre (ARC). They believe that every call that cannot be confirmed as a real fire is a false alarm. The inability to confirm that a fire is actually occurring could be down to several factors, one being that the occupants of the building cannot actually get to the phone to answer the ARC because they are trapped by the fire that needs confirmation!

So, what should the approach be with regard to responding to AFA Signals? This subject has been looked at by the Department for Communities and Local Government in their 2008 report: Costs and Benefits of Alternative Responses to Automatic Fire Alarms – Fire Research Series 2/2008. The report looks at the "optimal response to AFA calls" and concludes that: "the analysis shows that the optimal strategy minimises fire fatalities and maximises resources released to fire prevention activities while ensuring that response to actual fires is not delayed. The closest match is achieved by a Time and Risk strategy. The analysis presented herein suggests that the T&R1 policy that corresponds to a one pump attendance at day time AFA calls, two pumps to night time sleeping risk, and one pump to night time non-sleeping risk properties is the most favoured AFA response strategy."

Generally the use of fire statistics to inform an argument, for example, regarding false alarms is to be encouraged, however, that is fine except for the old adage: lies, damn lies and statistics! For example, if we look at the false alarms situation to really understand how the issue has changed over the last year or the last 17 years, then we need to know how many systems were connected in 2011 or 1995 and how this number has changed (almost certainly increased) since then. If we really want to understand the situation then we need to understand how many fire detection devices are connected in each system and how this number has also changed.

The problem is that this level of granularity of

statistics is not available in the UK but is the situation here any worse or better than in the rest of the world? Well, recently the FIA has formed a Special Interest Group that is looking at solutions (both technical and management based) to the false alarms problem; a thorough survey of the available information reveals little or no information on the false alarms situation on an international basis. Indeed for some countries even the collection of statistics concerning the number of fire deaths is patchy. So, I guess the UK is not that bad for statistics after all, even if in this case more information would further inform the situation. Perhaps for fire overall the well-worn adage should be re-coined as: lies, damn lies and no statistics.

However, this lack of solid information does not excuse the action of the relevant Fire and Rescue Services in England not attending AFA signals as this flies in the face of research.

What makes the situation worse for businesses is the postcode lottery approach of these English brigades to AFA attendance; for example, if you have a multi-site business with operations in London, Warwick, Birmingham and Exeter then currently you can expect respectively: attendance; no attendance; limited or no attendance and as for the last site well, they are considering their options and by the time this is published, who knows?

Could not they at least agree upon some sort of reasonably consistent policy between them? IFP

Graham Ellicott is CEO of the Fire Industry Association (FIA)

For further information, go to www.fia.uk.com


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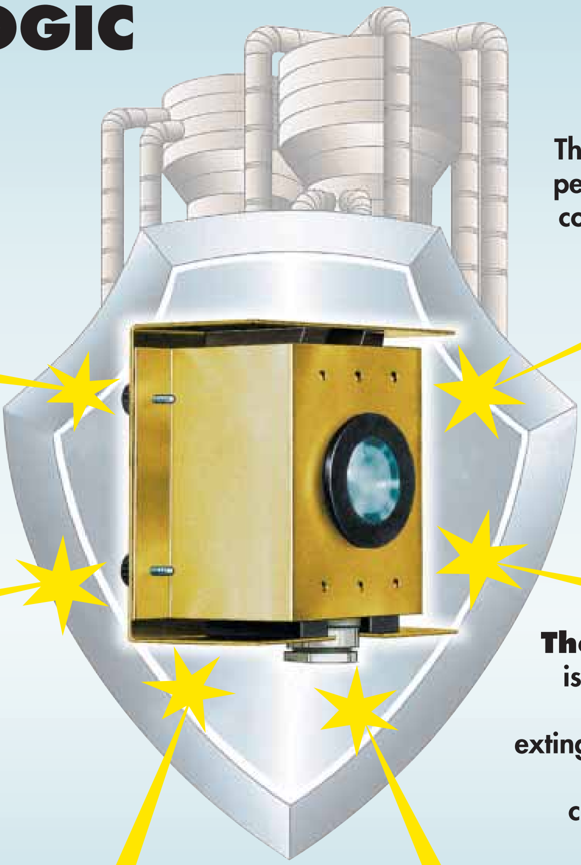

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Opening up the Debate on Fire Detection Protocols

Paul Pope

Apollo Fire Detectors

The debate surrounding open and closed protocol has recently reignited. Making the right purchasing decision is critically important and calls for a clear understanding of what is at stake.

Before we start looking at the ins and outs of open and closed protocol, let us begin by explaining what the term protocol actually means. When used in relation to electronic products, protocol is in essence the language that devices use to communicate with each other. In the case of fire alarm systems, this usually means the field devices such as manual call points, detectors and interfaces communicating with the fire control panel.

Modern fire detection systems constantly monitor the air and temperature around each smoke or heat detector, gathering information that is processed in the detectors and control panels to decide whether a fire is developing. Protocol is the way in which the control panels request and receive this information from detectors in order to ensure that abnormally high levels of smoke or heat are reported without delay.

In simple terms, fire detection systems can only be one of two different types of protocol: open or closed. The term protocol itself is not by any means new in the fire industry, but recent months have seen the debate surrounding protocol placed firmly in the spotlight. With open protocol systems growing in popularity and their benefits being more widely recognised, an increasing number of historically 'closed' protocol system suppliers have started to redefine their solutions as being 'open', when they are in fact closed.

Today's end users of fire detection systems face an increasingly diverse and often complex choice of solutions, so it has never been more critical that everyone involved in the purchasing decision understands the difference between the two types of system and the potential implications of this decision in years to come.

Closed Protocol

With a significant number of UK fire equipment manufacturers operating closed protocol systems,

Conventional Indoor Marine Manual Call Point

let us first take a look at this approach. These manufacturers offer both panels and field devices – effectively all the elements needed to provide an intelligent system. They have no need to disclose the nature of their protocol to any other parties and as such, equipment supplied by other manufacturers is not expected to be compatible with these systems. The protocol used is said to be 'closed'.

Manufacturers of equipment using closed protocols claim that all elements of their equipment (control panels, detectors, panels, call points, interfaces and special detectors such as beam detectors) will work harmoniously with each other, since it is all designed and made by the same company. The implication is that a system comprising detectors and interfaces from one manufacturer and control panels from another cannot work as well together as when everything comes from one manufacturer.

Those promoting closed protocol as the best solution would argue that by sourcing products from a 'one-stop shop', the purchasing process is simplified, with customers potentially able to make cost savings and having greater negotiating power because they are placing a single large order with one supplier. In today's economic climate, it is easy to see why companies will take a short-term view to their purchasing decision and be lured into this attractive, cost-saving option.

It is vital, however, that those responsible for purchasing a fire detection system understand that by specifying a closed protocol systems, they will be tied to a single manufacturer throughout the lifetime of the fire system. Consideration needs to be given to who will have the negotiating power when the system needs to be extended. Similarly, if the products or services fail to meet expectations, the customer or engineer is not at liberty to try another manufacturer's detectors as a means of eliminating the problem because they will not be compatible with the rest of the system.

Compatibility is without doubt the fundamental problem with closed protocol systems. There is no compatibility between equipment produced by different manufacturers, which restricts the system, resulting in only the original manufacturer or its agents being able to maintain it, and customers being entirely dependent on one supplier for spares, servicing, modification and upgrades of their systems.

It is also important to consider the longer-term implications of opting for a closed protocol system – when an upgrade or extension to the system is required in the future, customers will only have a limited choice and it cannot be assumed that products from the original closed protocol will still be available. In this situation, the cost of upgrading or extending will drastically increase as the only option is to replace the entire fire system and start again.

Open Protocol

There is an alternative to closed protocol. A number of device manufacturers, including Apollo Fire Detectors, do not make all the fire system components themselves and have instead built up partnerships with independent fire control panel manufacturers and, in some cases, companies that offer other synergistic products, such as aspirating smoke detectors. It is the field device manufacturer that normally determines the protocol used. In order to encourage independent manufacturers to design and develop control panels that are fully compatible, they publish and share information including technical data, enabling panel manufacturers and other companies to design compatible controlling equipment. As all the details of the protocol are disclosed to associated partners, it is referred to as an 'open' protocol.


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An open protocol system avoids many of the potential pitfalls of being tied to a single manufacturer. The benefits offered by open protocol systems include:

Choice:
An open protocol system makes products interchangeable across a wide range of manufacturers and offers freedom of choice in terms of product, installer and maintainer. The customer is free to choose between different experienced competing companies to service the system.

Expertise:
Different suppliers could be used for the components according to their specific area of expertise. Open protocol manufacturers can concentrate their core specialist skills and maintain flexibility in an integrated systems approach.

No Restrictions:
Upgrades, maintenance or replacement of products can be undertaken by any competent installer.

Availability:
Compatible products are available from a greater range of suppliers.

Competition:
Multiple providers create greater price competition and drive providers to keep customers because they give the best value and service.

Innovation:
Open protocol offers customers greater choice, as it drives manufacturers to innovate and create better products that people select because of their performance.

So, are there any pitfalls of opting for an open protocol system? One criticism sometimes directed at open protocol is that combining products from different manufacturers inevitably means that the system will not work as well as one where all the components are sourced from a single manufacturer. However, this is a false assumption as the certification and testing for all the components of the fire detection system remains the same. To use a sporting analogy, most Formula 1 racing cars are a combination of components from various specialist high technology manufacturers and are extremely successful. In this highly competitive sport it is an advantage to use the best in class, specialist manufacturers who can concentrate on their own skill areas. This is also true in the fire detection industry.

Basing fire system development on partnering rather than excluding other manufacturers encourages longevity. Manufacturers may come in or occasionally drop out of the partnership, but products compatible with the shared, open protocol will always remain. For example, the digital protocol that Apollo detectors use has been available since 1980, and has since been extended twice to ensure that Apollo technology is always the latest and most up to date in the industry. Although the Apollo protocol has been extended, it still ensures forwards and backwards compatibility between products, simplifying extensions of systems or replacement of detectors to accommodate changes of building use and making upgrades logistically easier because work can be carried out in phases over time.

Key Considerations

There are pros and cons for both closed and open protocol and the decision as to which type of fire detection system to be installed needs to be made on a case-by-case basis. There are, however, some key questions that should be asked and the following checklist is a useful starting point when beginning the process of purchasing a new fire detection system, whether open or closed protocol:

- Is the manufacturer a well-established company?
- What after-sales service is offered by the manufacturer?
- How long will the product range be supported?
- What is the manufacturer's upgrade policy?
- Will the manufacturer maintain product backwards and forwards compatibility?
- Can the system maintenance be carried out by any competent third party? If yes, what knowledge, protocols, equipment, software passwords etc are required?
- What is the cost of maintenance for the life of the system?
- What is the cost of replacement parts (detectors etc) for the life of the system?
- What are the labour rates for service and call outs and the rates for software upgrades?

Conclusion

The objective of this checklist is to make decision makers consider the total cost of ownership (TCO) rather than just the purchase price when making a financial comparison between fire detection systems. The TCO includes all of the additional costs required to support and maintain the system purchased for its lifetime.

The protocol of a fire detection system must be considered at the purchasing stage in order to help determine the total lifetime costs. Even where one option seems to offer an initial cost saving, it is the whole life cost of the fire system – and how easy it will be to maintain to a standard that meets both current and future requirements – that must be the priority of the fire safety professional. IFP

Paul Pope is UK Sales Manager at Apollo Fire Detectors

For further information, go to www.apollo-fire.co.uk

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Phil Saxton

Draeger Safety UK

Most major accidents do not just happen; they are usually a culmination of a series of events which, while in themselves minor, can add up to a serious problem. The detection of even the smallest gas leak can put a stop to a chain of events that will take on a life of its own and which, if not dealt with properly, may even take life itself.

Invisible to the naked eye and often impossible to smell or hear, gas leaks can pose a very dangerous threat to both people and plant. Depending on their substance, quantity and location, they can cause immediate ill health and may also lead to plant shutdowns and even explosive situations.

Gas detection can help to solve the problem, but only if the right system is used, the right sensor is selected and, on an on-going basis, the right maintenance is carried out. Cheaper, off-the-shelf gas detection systems may appear to solve the immediate problem but, in the longer term, they can lead to higher costs in terms of false alarms, high levels of maintenance and, sometimes, even installation problems.

The good news is that even the best-in-class gas detection systems do not have to be expensive. When taking lifetime ownership costs, reduced maintenance, unnecessary plant shutdowns and false alarms into account, the latest technology and most innovative sensor capabilities can be

a Total Solution

available to all. However, cost is not everything. Today's savvy health and safety professionals are looking at complete personnel and plant solutions rather than knee-jerk reactions to what appears to be a straightforward "product" requirement. Encompassed in that solution, they also want, and expect, high quality products along with high quality service and reliable on-going support.

The Polytron 7000 uses intelligent sensors

A Total Solution

For real peace of mind, conscientious purchasing personnel should ensure that any solution provider is not only highly reputable but also offers both pre- and after-sales service and support from experts in their field.

Encompassing selection, installation, service and maintenance, as well as training, this level of supplier support can pay real dividends. Whether it be a portable, transportable or fixed gas detection solution, the supplier should, as a result of his or her expertise in both gas detection and industry, understand the problems and safety issues associated with the application concerned.

As a result, they should also be able to offer advice on the type of sensor such as electrochemical, catalytic bead, infra-red (IR) and open path. The application itself, and for example, whether intrinsically safe, ATEX approved product is required, will determine the installation method and/or the need for personal, area or perimeter monitoring. When looking at reduced maintenance and service costs, the supplier should also be able to help ensure that the equipment is properly maintained and used by personnel who are properly trained to do so.

Additionally, where planned shutdowns are involved, for instance, a reputable supplier will not only be able to provide the right gas detection equipment on a short or long term rental basis – but also train the personnel involved on how to use that equipment. This is particularly beneficial where permanent or full-time detection is not required but is essential to the safety of plant and third party personnel during scheduled site maintenance, or machine changeovers etc.

Understanding is the Key to Safety

When considering gases there are three basic types:

- **Ex**: Where there is a risk of explosion by flammable gases.
- **Ox:** Where oxygen is involved and can lead to asphyxiation by oxygen displacement (deficiency) or increased flammability by oxygen enrichment.
- **Tox**: Where the gas is toxic and poisonous.

Very few gases can be detected by sense of smell. For example, low concentrations of hydrogen sulphide (H_2S) may easily be recognised by its 'rotten egg' characteristics but, because the smell is quickly accommodated by the nose and the smell "disappears", high concentrations remain undetected. This makes the gas extremely dangerous, especially if personnel escape into areas that they believe are clear because of a lack of odour.

Even apparently harmless gases such as helium or nitrogen can become dangerous when oxygen is displaced by their sudden release. Not only is there a danger of suffocation but oxygen concentrations of less than 6 Vol% can be lethal. An excess of oxygen (more than 21 Vol%) can increase the likelihood of flammability and may even cause auto-ignition of flammable materials. Hence, there is not only a danger to life but to plant as well.

Recognising the Responsibility

The toxicity of industrial gases is determined by the threshold limit value and the only way to ensure a worker's safety is to make sure that, when a hazard exists, proper control and warning measures are in place. The only way to ensure that these measures are appropriate is to measure the hazard, and the only safe way to do that is with trustworthy gas detection equipment.

Some gases such as carbon dioxide, propane

Colorimetric gas detection system detects in ppb

and toluene are measured in parts per million (ppm), but others, such as chlorine and phosgene, are measured in parts per billion (ppb). With flammable gases, they are categorised by a lower explosive limit (LEL) and the lower the limit, the more dangerous they are. For instance, n-Hexane carries an LEL of 1.0 whereas hydrogen is 4.0. Flammable vapours have a flashpoint (calculated in degrees C) and, again, the lower the flashpoint, the more lethal they become with diethyl ether having a flashpoint of –40 and xylene +25.

Designed to protect both individuals and plant facilities, gas detection systems alert personnel to an immediate danger, can trigger alarms and activate counter measures such as a complete plant shutdown. The capabilities of the system should reflect the dangers that might occur as well as the practicalities of its use. For this reason, a wide range of gas detection instruments exist in different forms:

Portable Options

Portable gas detection instruments range from single gas monitors through to ATEX approved, multiple gas detection instruments. As small and as portable as a mobile phone, those that use the latest technology incorporate powerful, highly sensitive, miniaturised sensors for fast, accurate gas detection readings. These sensors are not only transforming the shape of gas detection instruments but they also offer longer life and, to the user, bring reduced costs in terms of both maintenance and calibration requirements.

Recent innovations include gas inlets at the top and front of the instrument to ensure that users are kept safe, even if the gas detector is accidentally placed in a pocket or a gas inlet is covered. Triple alarms can visually, audibly and physically alert the user of a hazardous gas concentration and these tiny instruments can also incorporate an integral data memory to record gas results complete with date, time and gas concentration. They can also be immune to poisons such as hydrogen sulphide and can be used to detect explosive hazards as well as toxic gases and vapours.

Large illuminated displays ensure that readings can be seen at a glance and retro-reflective panels allow easy location in the dark or in water. External pumps are also available and can be supplied with hoses up to 20 metres long for pre-entry

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measurements in tanks or pipelines. An integral data logger allows data such as measured values and configurations to be transmitted via IR interface to a PC.

Wireless Safety

Unlike portable instruments that leave the scene with the wearer, wireless systems interact with each other to provide a 'safety net' and can be left

in situ to operate for up to 120 hours.

Providing visual and audible confirmation of a protected "safe zone", they are ideal for maintenance or plant shutdowns. As soon as one of the units detects a gas it immediately transmits an alarm to each of the others, warning everyone in the area that the danger exists. At the same time, a loud evacuation alarm is emitted and a 360° alarm amplifier ensures that it is heard with the same intensity in all directions. The areas where gas has been detected are indicated by red visual alarms for as long as the danger remains. Safe atmospheres and, therefore, a safe escape route are confirmed by green visual alarms.

Allowing gas ingress from every side, the units can be used in conjunction with the X-am 5000 or the X-am 5600 fitted with up to four sensors to detect as many as six gases at once to provide simultaneous measurement of gases and vapours such as hydrocarbons, hydrogen and other explosive, combustible or toxic gases. As well as Zone 0 ATEX performance, they also offer a lower cost of ownership by combining flexible monitoring capabilities with a long sensor life and enhanced battery performance.

Fixed Fire and Gas Systems

Where the detection of toxic gases or oxygen depletion is concerned, larger, intelligent electrochemical sensors have eclipsed traditional small and mass produced versions. Able to communicate with the transmitter, they feature an EPROM memory that stores calibration information as well as gas data (target gas and range).

Incorporating temperature and pressure compensation, this built-in intelligence not only leads to higher accuracy but also extends calibration intervals to just once a year. In addition, they offer improved longevity that, in turn, means fewer replacement sensors are required. As a result, the lifetime costs of the system are significantly reduced. Available with a variety of mounting capabilities, they also offer better flexibility in terms of selectable response times and ppb test rates.

These newer electrochemical sensors are also easier to use. As the gas data is stored within the sensor itself and the sensors arrive pre-calibrated from the manufacturer, they no longer have to be calibrated in the transmitter. In addition, the plug-in construction offers true "plug-and-play" functionality and, once installed in the transmitter, the EPROM will communicate with the transmitter without further intervention or calibration by the operator.

Advances in technology and better manufacturing techniques have also improved the detection of flammable gases and vapours with traditional pellistor or catalytic bead detectors being replaced by superior technologies such as infra-red (IR).

sIR technology is more robust and stable and is immune to poisons such as H_2S. The increased accuracy of IR is also able to reduce maintenance and calibration intervals. Instead of the need for six-monthly or, in some cases, the more frequent calibration intervals required by catalytic devices, IR systems can extend calibration intervals to one year. Together with an overall life expectancy of more than 15 years, this technology dramatically reduces lifetime ownership costs.

The use of open path IR technology can also help where cabling is concerned. For instance, where a multiple infra-red beam is transmitted over a distance of up to 200 metres to a separate receiver, IR sensors can significantly reduce cabling costs.

Nuisance odours can turn into life-threatening hazards, particularly where substances such as hydrogen sulphide and ammonia are involved. These hazards need colorimetric systems that can detect low levels of toxic and corrosive gases at the odour stage, in ppb.

With continuous monitoring systems and requiring no calibration, systems of this kind offer a low cost of ownership. With built-in data logging to record concentrations over time, they can be ideal for perimeter monitoring applications and can also be used to predict breakdowns or to identify reduced efficiency in, for example, stack scrubber applications. IFP

Phil Saxton is Sales and Marketing Director at Draeger Safety UK

For further information, go to www.draeger.com

A Sporting Chance

Rick Love

Notifier by Honeywell

London's major new 80,000-capacity 2012 Olympic Stadium has been built to wow the world – and is a far cry from the local sports arenas used by communities across the country.

Regardless of type or capacity, when it comes to providing support facilities, there are common requirements that must be addressed in the design and implementation of appropriate and effective fire detection and alarm solutions for all sporting venues, from the 500-acre Olympic complex to a more modest football club ground.

As well as protecting the core sports events, these venues will be also used to some degree for a number of other activities for participants, staff and spectators. In the case of a local football club or sports centre, it is likely to incorporate catering and offer other facilities to the broader public to maximise revenues.

In this respect, these multi-faceted requirements make the local club ground no different from a larger sporting venue, including Doncaster Racecourse, for example, where the most recent five-storey Urban-I grandstand includes new hospitality suites, catering outlets and major conference facilities.

Protecting the Rose Bowl

The recent development of an appropriate fire safety system for the UK's Hampshire County Cricket's home site also highlighted the need for a flexible fire safety response. Built in 2000 as Hampshire's new county ground, Southampton's Rose Bowl recently underwent a further £45 million re-development as the club looked to reinforce its credentials as a major venue for international test cricket.

Ground capacity was increased to seat 25,000 spectators, with the addition of two new stands with hospitality boxes overlooking the ground. As a result, it has been chosen to host one- day internationals this year against both the West Indies and South Africa. There are also plans for a new 175-bedroom, 4-star hotel. As well as sporting fixtures, the Rose Bowl is also an important conference centre, staging big-name pop concerts, featuring Oasis, The Who and Neil Diamond. Fire safety at such a high profile, multi-purpose arena needed to be of the highest international standard – and meet all the selection panel's tough demands.

The solution chosen contained two networked fire alarm control panels to provide fully-integrated protection for the whole ground, including the planned hotel. Meanwhile the inbuilt intelligent digital network solution ensured that complex cause and effect rules allow rapid and effective response to any fire-related emergency.

Management of the fire safety system at the Rose Bowl is also made much easier for the ground staff thanks to an advanced graphics package, which offers a comprehensive view of the complete system in a simple, easy-to-read manner. In the event of an alarm, they can immediately pinpoint the exact location of the problem and take appropriate action. The comprehensive solution used is also supported by an integrated voice alarm and public address (PA/VA) system, which allows the Cricket Club to broadcast a wide range of different messages as well as controlling safe, phased evacuation.

Complex Requirements

A robust fire detection system was also needed to protect the grounds of the West Country rugby union club, the Exeter Chiefs. Implemented in 2011, the system installed is linked to a voice alarm and public address system and provides full fire protection for the Sandy Park ground, which also incorporates one of the top conference centres in the South West of England.

Protecting this multi-functional facility meant taking multiple requirements into consideration,

# of Survival

including the huge crowds attending the Chiefs' home games, the conference delegates and the large number of staff involved in manning the events, many of whom are temporary.

As the Exeter Chiefs experience shows, over time, many sports venues will expand and become subject to change of use, which again demands that the fire safety solution must be able to provide adequate protection for all aspects of what, in most cases, is a multi-purpose public facility.

Match-winning Solutions

The All England Lawn Tennis and Croquet Club, better known as 'Wimbledon', has undergone considerable change since the first championships were held in a garden-party atmosphere back in 1877. In recent years, the evolution of the site has seen a rebuilt No. 1 Court, a roof for the Centre Court and a new 200° cinema and museum.

In 1993, the Club unveiled a 25-year long-term plan designed to improve the quality of the Wimbledon experience, including safety for players, members, spectators, officials, the media and all those working at the event. Its principal requirement as a fire safety protection system was total reliability and the ability to deliver quick, accurate and precise information that identified the location of any incident.

The first phase of the solution was completed in 2004 and consisted of 10 control panels, providing 42 loops divided into 284 fire zones and more than 3,000 addressable smoke and thermal detectors and modules. The individual control panels are networked over 2.5km of fibre optic cable and can transmit an alarm across the network in less than half a second.

The All England Club system also drives five separate graphic stations located at key control points around the facility. The solution interfaces with an existing staff paging system so that fire-trained staff can investigate any potential incidents as quickly as possible, before a general alarm system signal is broadcast. Using the advanced graphics workstation, fire-trained staff can rapidly isolate and investigate any incident across the 43-acre site. As a fully addressable system, it pinpoints quickly the source of any problem and is supported by visible and auditory alarms to warn all those on site that may have a disability.

Following its implementation, the value of the comprehensive solution was proven one New Year's Eve when fire broke out at the site. Working with the fire investigation team after the fire, buildings and services staff had the necessary technology to log and check the sequence of activations, determine the source of the fire and calculate how quickly it had spread through the building.

In 2009, Wimbledon fans received a boon when a 3,000 tonne retractable roof was built on Centre Court. Less visible to the general public, but no less crucial, fire safety was given top priority. The net result was the inclusion of 14 air handling units, four intelligent 8-loop control panels and a combination of aspirator and conventional point smoke detectors throughout the roof complex that provide early warning of any problem.

A Flexible Response

Whatever the venue, a best-practice fire detection and alarm safety system for a sporting venue must offer a high degree of inter-operability and scalability. This will make the most of any existing investment and enable a seamless transition as the facility undergoes expansion or change. Equally, the system must offer maximum robustness and flexibility in providing suitable protection for every aspect of a diverse multi-functional site.

Two other technologies are also now playing an increasing role in providing cost-effective, high quality protection for sports and leisure facilities. In supporting early detection and response, an important development has been that of multi-criteria detection.

Another important aspect in providing complete protection for environments where there are often large numbers of people in a single location, including sporting arenas, is the ability of such devices to minimise the incidence of false alarms. As they are able to determine more accurately the individual components of a fire – including heat, visible smoke, carbon monoxide and flame sensing – multi-criteria devices are less prone to false alarms than their single sensor counterparts, as it is more difficult to falsify two criteria than one, three more than two, and so on.

Once a fire-related incident has been identified, it is then critical to ensure that users, staff and spectators alike are able to respond quickly and correctly to a fire warning. In response, sophisticated and intuitive integrated voice alarm and public address systems have evolved to form a key part of a comprehensive fire detection and alarm strategy for these kinds of complex environments, where individuals respond to warnings in different ways.

This benefits both building operators and firefighters called to deal with any emergency, as they are easily able to take over the VA/PA system to broadcast individualised messages, in order to ensure rapid yet controlled evacuation from any part of the premises that may be at risk.

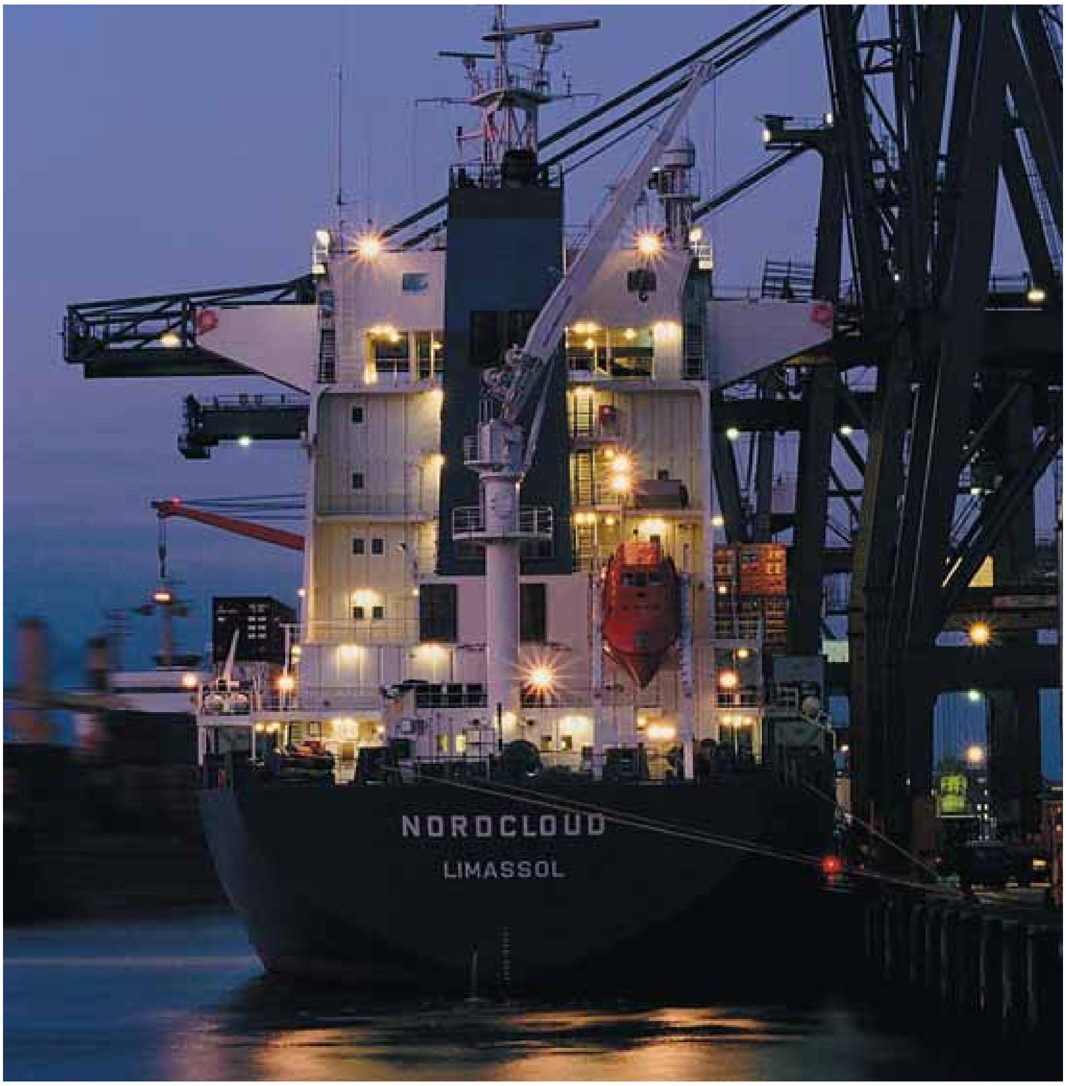
Safety First

As with all industries, the onus is on life-safety support for sports venues to be as competitively-priced as possible. Yet, with thousands of lives at stake, it is crucial that the solutions meet the often complex needs and the broadest demands of any sports facility. Fortunately, advancements in life-safety technology now make meeting the demands of even the most complex sporting venues achievable – even within the constraints of today's toughest budgets. IFP

Rick Love is Product Manager at Notifier by Honeywell

For further information, go to www.notifier.com

Raising the Bar on



Nick Grant

Firetrace International

While fire accounts for a relatively small proportion of crane accidents, it is a constant life-threatening risk that needs to be given greater attention.

A fire in any vehicle or occupied piece of equipment is a spine-chilling prospect, but when that fire takes place several metres above ground, the odds against the operator surviving the blaze are dramatically reduced. A serious crane fire inevitably also has costly financial implications. Not only does the crane itself require expensive repair or replacement, its being out of action can have serious cost implications down the line. This is particularly so, for instance, when the fire involves a dockside crane where delays in loading or unloading cargo have the potential to run into tens or hundreds of thousands of dollars. In crane replacement cost alone we may be looking at anything between two million dollars and five million dollars.

In these circumstances it is perhaps surprising that the majority of cranes have little or no fire detection or fire suppression equipment. This is particularly so when the cost of providing effective fire protection to the vulnerable areas is miniscule when compared with the capital cost of the crane, its operating cost or the potential consequential damages of a fire. In many instances, the only fire precaution is the provision of a portable fire extinguisher in the operator's cab.

High Risk Areas

Few in number though they may be – or at least appear to be as many do not find their way into official statistics – crane fires do occur, and the source of the outbreaks is significantly consistent.

A recent fire in a crane in Sydney, Australia was investigated by the local fire and rescue brigade, which identified that the fire originated in the crane's engine compartment before spreading and causing extensive damage. Around about the same time a crane fire in Tehachapi, California, USA spread to completely engulf the crane cab – a fire that was made worse when a large quantity of diesel was spilled after the fuel tank ruptured during the blaze. Both of these events demonstrate

Crane Fire Safety

two characteristics of crane fires; they invariably start suddenly and, as fuel or oil are usually involved, they take hold very rapidly.

But, why are crane engines and generators so prone to fire? The answer is that, along with the crane's fuel and the risk of fuel line rupture, there are any number of flammable liquids present throughout the engine compartment. These include hydraulic fluids, as well as combustible accumulated grease on the engine block, for which frayed or damaged electrical wiring can easily provide the ignition source. Additionally, other combustible materials can sometimes be found in or around engine compartments. An example of this is where the crane has been used to handle, coal or other flammable dust or debris-generating cargoes.

These assertions are borne out by estimates based on a US Department of Homeland Security NFIRS [National Fire Incident Reporting System] and NFPA [National Fire Protection Association] survey, which found that mechanical and electrical failures or malfunctions account for the majority – around 60 percent – of off-highway vehicle and equipment fires, with the engine compartment being cited as one of the most common locations for the outbreak of a fire.

Not that the crane fire risk is restricted solely to engine and generator compartments; electrical control cabinets are another high risk area. The functioning of these compartments is essential to the continued operation of the crane.

wide range of environments. Gottwald Port Technology is a member of the Demag Cranes Group and concentrates exclusively on cranes for material handling in ports and terminals.

SAQR Port is located strategically at the northern end of the Ras al Khaimah emirate, close to the Strait of Hormuz entrance to the Persian Gulf. Its main activity is cargo handling, and it is the major Middle East bulk port for bulk cargoes, aggregates, oil and cereals. Menard Gulf LLC is involved in huge, multi-million square metre infrastructure projects in the new Kuwait cities of Jaber Al Ahmed and North West Sulibikhat.

In both instances, the companies were prompted to install fire detection and suppression following crane fires that, in one instance, cost two million dollars of damage.

Dedicated Detection & Suppression

While both organisations evaluated a number of possible solutions, the majority fell short of what, in reality, is a demanding list of performance requirements.

The key requirement for both companies was to ensure 100 percent response reliability, 100 percent of the time. Due to the very nature of crane operation it was also deemed essential that the chosen solution should provide around-the-clock, unsupervised protection and be capable of withstanding heavy and sometimes erratic vibration, and potentially corrosive working environments.

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Acknowledging the Challenges

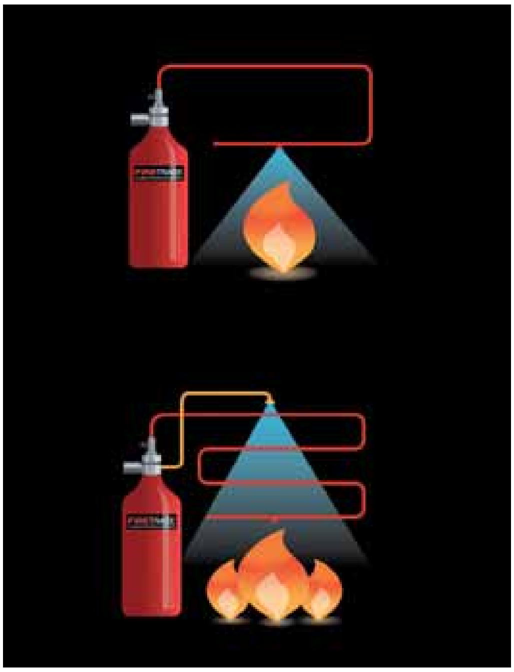
Clearly though, the crane fire risk is being taken seriously by a growing number of operators as is demonstrated by two recent examples where dedicated fire detection and suppression systems have been installed in dockside cranes.

SAQR Port at Ras al Khaimah in the United Arab Emirates has adopted a solution to protect the engine bays and electrical cabinets of its six new Gottwald and five new Liebherr harbour cranes, and the engine compartments of its ship loaders, while sustainable technology company, Menard Gulf LLC, has adopted the same fire detection and suppression technology to protect the engine bays of its ten new and existing Liebherr cranes in Kuwait.

Liebherr builds a wide range of mobile cranes with telescoping or lattice booms on wheeled or crawler-tracked undercarriages, to operate in a

The potential for serious injury or loss of the crane operator's life, coupled with the prospect of significant financial loss should a fire escalate, meant that another major requirement was proven ability to stop a fire precisely where it starts and before it has had an opportunity to take hold and spread. A deal-breaking requirement was that the solution be intrinsically safe and require neither external electrical nor other power, which has the potential to fail and so put the system out of operation was seen.

Ultimately, the decision was taken to opt for a tube-based system as they are specifically designed to provide dedicated protection for enclosed spaces, combine detection and suppression in a single integrated package, can be retro-fitted to existing cranes, and utilise fire suppressant agents that are appropriate to the particular fire hazard and the equipment being protected. Easy agent



clear-up after discharge was also in this type of system's favour.

Although there are a few such systems on the market, both companies decided in favour of Firetrace International's Firetrace system as it is alone in being the only UL [Underwriters Laboratories] listed, FM [Factory Mutual] approved and CE [Conformité Européene or European Conformity] marked tube-operated system in the world that is tested as an automatic fire detection and suppression system.

radiant energy from a fire, it ruptures and the suppression agent is instantly discharged.

There are two Firetrace systems: the Firetrace Direct System and the Firetrace Indirect System. The Firetrace Direct System utilises the Firetrace tube as both the detection device and the suppressant delivery system. When the Firetrace Detection Tube detects a fire anywhere along its length it ruptures, forming an effective spray nozzle that automatically releases the entire contents of the cylinder. This system was chosen by SAQR Ports for the electrical control cabinets.

The Firetrace Indirect System was selected by both companies for the engine compartments. This system uses the Firetrace tube as a detection and system activation device, but not for agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube. The agent is discharged immediately from the cylinder through diffuser nozzles, flooding the entire cabinet.

Agent Selection

Agent selection is critically important in this type of application; ABC dry chemical powder was identified as the most appropriate agent for the engine compartments and 3M Novec1230 Fire Protection Fluid was the agent of choice for the electrical cabinets.

There are several good reasons for selecting ABC dry powder for the engine compartments; as the name implies, it is ideal for Class A, Class B and Class C (Class B in the USA) fires. The agent insulates Class A fires by melting at between 182°C and 205°C, and breaks the chain reaction of Class B and Class C (Class B in the USA) fires by

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Firetrace can only ever be activated by a real fire, so there is no prospect of false alarms or unnecessary agent discharge that might otherwise curtail operations. In fact, although there are 150,000 Firetrace systems around the world, there has not been a single instance reported where a Firetrace system that has been correctly installed and maintained has either false alarmed or failed to detect and suppress a genuine fire.

Chosen Solution

Briefly, the Firetrace system comprises an extinguishing agent cylinder that is attached to technically-advanced proprietary Firetrace Detection Tubing. This leak-resistant polymer tubing is a linear pneumatic heat and flame detector that is designed to deliver the desired temperature-sensitive detection and delivery characteristics. It can be routed throughout the enclosure being protected – the engine bays and electrical cabinets. When this tubing is exposed to heat and

coating the surface of flammable liquids to which it is applied. Following discharge it leaves a residue that absorbs flammable liquids, helping to avoid re-ignition. However, the particles of powder are too large to penetrate engine air filters and so only the exposed external engine surfaces will need to be cleaned after a system discharge, by wiping, vacuuming, or washing.

3M Novec1230 Fire Protection Fluid also quickly knocks down Class A, Class B and Class C fires without any risk of thermal shock damage to delicate electrical equipment. As, arguably, the leading replacement for Halon 1302 it is electrically non-conductive and non-corrosive. Novec 1230 leaves no oily residue so clean-up is unnecessary following an agent discharge. Although stored as a low-vapour-pressure fluid, when Novec 1230 is discharged it transmutes into a colourless and odourless gas, using a concentration of the fluid that is well below the agent's saturation or condensation level. IFP

Nick Grant is Vice President and General Manager of Firetrace International's EMEA operation

For further information, go to www.firetrace.com

Testing Voice Alarm and Mass Notification Systems

Mike Perrino

Code Consultants Inc.

Successful testing of voice alarm and mass notification systems depends on understanding the factors that affect intelligibility and use of the proper commissioning methods and equipment.

Intelligibility is one of the latest buzz words in the world of fire alarm systems. Codes have required voice alarm/communication systems (VA/CS), referred to as emergency warning and intercommunication systems (EWIS) in Australia, for some time. In addition, mass notification systems (MNS) are now being required in certain cases to allow an alert to be broadcast simultaneously to large numbers of people. Both systems depend on getting intelligible messages out to a target audience – messages that can be heard and understood by the people the system is designed to warn.

Careful design is the first step to a system that will meet the intelligibility requirements of the appropriate code. Proper installation is also important, but even after the system is designed and installed, it must also be tested to assure that it can work as intended.

These systems must be tested not only to ensure that the message can be heard (audibility), but also that the words of the message can be understood (intelligibility). During the development of testing standards, the problem was, how can such systems be tested to ensure that the message can be understood? Human hearing differs greatly among individuals. Age, exposure to noise, heredity and other factors determine a person's ability to actually hear and comprehend a message.

The acoustics of a space also play an important role in the ability to hear and understand a system's message. Large spaces with hard surfaces are prone to echoes and reverberation that can have the effect of scrambling a voice message. Soft surfaces soak up sound, and can drop the level of the alert below audible levels and either mute or reinforce certain frequencies, making the message difficult to understand.

All of these factors make reliable testing of voice alarm and mass notification systems difficult if not impossible using human hearing as the test standard. The need for reproducible and consistent results led to the development of methodologies that allow a more standardised approach to the testing of these systems.

The National Fire Protection Association's Standard No. 72, National Fire Alarm and Signalling Code, outlines the requirements for the design and testing of voice/alarm communication systems.

Similar requirements are also contained in the Australian and United Kingdom fire alarm design standards.

Acoustically Distinguishable Spaces

NFPA 72 defines an area with distinct acoustic characteristics where a message will be broadcast as an Acoustically Distinguishable Space (ADS). This can be a zone or a portion of a zone that is designated to receive an occupant notification message. These spaces are defined either by physical subdivisions, such as walls or floors, or a space with acoustic properties that distinguish it from other spaces in the building. Some spaces may include small dimensions, better damping or numerous non-parallel surfaces that decrease reverberations and increase intelligibility. Other spaces may be large, have numerous hard or parallel surfaces where obtaining an intelligible result can be challenging. Note that certain ADSs may never yield an intelligible result, and may require an alternate method to meet the intent of the applicable code.

ADSs must be designated as part of the system's design, in order to allow designers to evaluate the best method to ensure intelligibility. The individual ADS should also be reviewed by personnel before commissioning begins, so that appropriate testing can be planned for each space.

More Complex Test Methods for a More Complex System

Audibility and intelligibility are not the same things.

Audibility is simply the ability to actually hear a signal or announcement above any noise that may be present. If the signal is provided with enough power by the system to overcome background noise by a certain amount, it will be audible. Audibility can also be measured as a physical quantity, in decibels (dB). If an alarm signal is required to be at least 15 dB above the ambient noise in a space, both of these parameters can be measured in dB, compared, and verified for compliance.

Speech intelligibility, in the context of voice alarm and mass notification systems, is an indication of how understandable a message is when it is broadcast into a space. This is why a different methodology was developed to test these systems. This makes voice alarm and mass notification system testing much more complex, and requires testing of all spaces with specialised equipment designed for this particular purpose. Understanding the factors that can impact intelligibility is also important to efficiently testing a system.

What Factors Affect Intelligibility?

A number of factors can affect the ability of a fire alarm system to effectively alert building occupants of an emergency. In the case of voice alarm and mass notification systems, these factors are multiplied, since they must be audible and visible, as well as intelligible. Voice alarm systems are affected by numerous factors that can cause a system's message to be unintelligible.

How Transmission Path Factors Affect Intelligibility

It helps to understand the three factors that affect the 'transmission path' from the speaker to the listener.

- **Speech Signal to Noise Ratio**

Speech signal to noise ratio simply describes the need for the signal (voice message) to be heard above the ambient noise level of a space. In this way, it very much resembles the requirement for non-voice-based systems. As required by the latest editions of the International Building Code, the tone portion of an alarm signal must be at least 15 dB above ambient noise. For example, the signal for a space with a background noise level of 90 dB would be 105 dB. This is perhaps the easiest parameter to control, since sufficient amplifier power can overcome this potential problem.

- **Sound Decay**

Decay is the change that takes place in the signal after it has been reproduced by the loudspeaker. Decay, oddly, can be 'good' or 'bad', depending on the acoustics of a space. Good decay could include a signal that is enhanced or reinforced by the configuration of a space. This can occur in spaces with a useful mix of absorptive and reflective materials, or a shape that reinforces the signal so it can be heard for greater distances.

Bad decay includes echoes and reverberation. Echoes are long interval, discrete reiterations of a signal. A true echo is a single reflection of the sound source. The time delay is the extra distance divided by the speed of sound. Echoes can affect intelligibility by doubling (or tripling, etc.) the signal through reflection from a hard surface or surfaces. Portions of the signal then begin to overlap and become difficult to understand. Typically, this only occurs in very long or very large spaces and can have a significant impact on the system's ability to produce intelligible messages.

Reverberation is numerous short interval reiterations of a signal. Reverberation time is proportional to the dimensions of a room and inversely proportional to the amount of absorption present. A room's reverberation time can be affected by the size and shape of the enclosure, and the materials used in the construction and finish of the room.

Objects within a room will also have some effect on the reverberation time and number of reflections. This includes furniture, equipment and people. Reverberation can be a problem because when numerous reflections arrive at a listener, the ear will likely not be able to distinguish among them. This can render the signal unintelligible.

- **Distortion**

Distortion is the degradation that takes place prior to or as the signal is being generated. Harmonic distortion is commonly generated by the system's amplifiers, although modern solid-state amplifiers do not exhibit this in large amounts unless

overdriven. Harmonic distortion can add overtones to a signal that distort the sound reproduced at the loudspeaker.

Intermodulation distortion is generated by a system's speakers, usually due to the "Doppler effect". A speaker can generate new frequencies that were not a portion of the input signal when required to produce high and low frequency signals simultaneously.

Harmonic and intermodulation distortion can be minimised in voice alarm/communication systems and mass notification systems through careful system design, where the amplifiers are sufficiently powerful and speakers are designed to operate at the power ratings and in the frequency range needed to produce adequate volume without generating noticeable distortion.

Equipment and Testing

In order to properly test these systems, specialised equipment and signals must be used. Most governmental jurisdictions will not have the equipment or expertise needed to accomplish this testing. This is why jurisdictions generally depend on certified testing companies and personnel, trained in the proper methods, to test and document a system's compliance.

In the United States, the most used test method is STI – Speech Intelligibility Index. This is the method described as a portion of Annex D of NFPA 72. The method is outlined in IEC 60268-16, "Sound system equipment – Part 16: Objective rating of speech intelligibility by speech transmission index", 2003.

The following items are needed to produce and sample this type of test signal:

- An audio source unit (also known as a Talkbox).
- Speech Transmission Index-Public Address Audio Recording (CD).
- Field Test Meter (analyser)

Each of these devices serves a specific purpose in the testing and approval process. The audio source unit (ASU) is a device that pre-amplifies the signal, usually from a CD recording of a Speech Transmission Index-Public Address (STI-PA) Audio Recording. This is a recording of an audible signal used to consistently measure the sound that is broadcast into a space for intelligibility.

The pre-amplified signal is either is played through a speaker into the fire alarm system's microphone, or input directly to the alarm panel of the system. The panel then amplifies the signal and broadcasts it throughout the space under test.

The STI-PA test signal contains known modulation rates. Once the signal is being broadcast, a field test meter is used to sample the sonic output of the system at a number of measurement points within each space. By measuring the difference between the sonic output of the alarm system, as sampled by the test meter, and known sound qualities of the recording, the meter computes the Standardized Transmission Index (STI) number. This number is a rating of speech transmission quality with respect to intelligibility.

Each acoustically distinguishable space is tested in a number of locations, and the test result in each location is noted on a drawing or in some other manner to record the various readings obtained in the space.

It is generally recommended that a space be tested with all finishes and furniture in place, and during a time when it is fully occupied. Unfortunately, the STI-PA signal must be broadcast the entire time of testing. Since these signals will sound like annoyingly random noise to building occupants (not to mention the commissioning personnel), testing can cause considerable disruption of normal operations. In this case, the unoccupied and occupied ambient noise levels and an unoccupied STI measurement can be taken at each measurement point. These three measurements are then post-processed on a computer running dedicated software to produce a final STI number for each tested location.

Interpreting the Results

Once testing is completed and the system is restored to a normal condition, the results are collated for each acoustically distinguishable space. In order for a space to be approved, a minimum measured STI must be achieved. As an example, NFPA 72 requires that no sampled STI at any measurement point be below 0.45, and the average measured STI number must be at least 0.50.

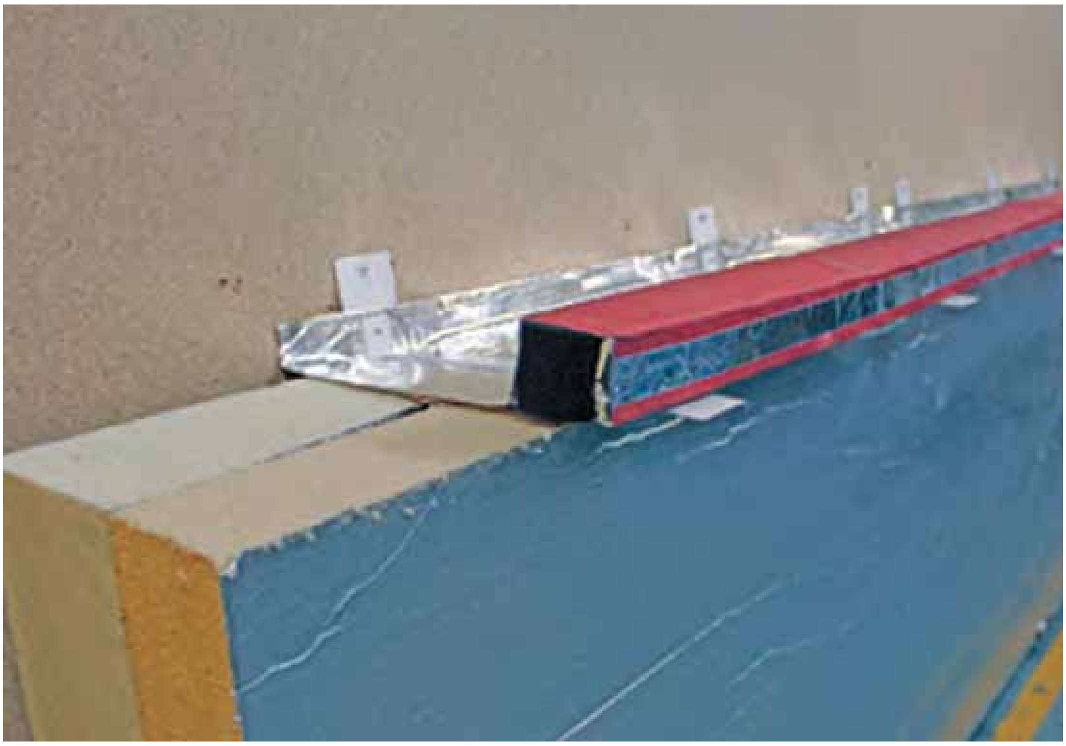
Test results for each ADS should be documented, and a report including all of the relevant information regarding the testing and results should be submitted to the authority having jurisdiction. If areas do not meet the passing criteria, either the notification system or the space must be re-evaluated, and modifications made to improve intelligibility of the space. The space must then be retested to assure that the minimum acceptable STI is achieved.

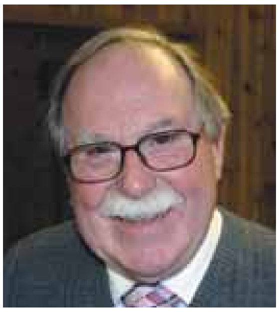
Understanding the complexities of the design and testing of systems that must provide an intelligible message is critical to successful implementation of this technology. But when properly implemented, these systems greatly improve life safety by giving occupants clear instructions or other information critical to an orderly emergency response or evacuation. IFP

Mike Perrino is Senior Project Consultant at Code Consultants Inc

For further information, go to www.codeconsultants.com

If You Cut It, Make





Derek Ward

Carpenter Ltd

It has long been recognised that the best way to prevent fires spreading in a building, is to contain them as quickly and effectively as possible. So, filling holes left by the introduction of pipes and cables is essential for fire containment.

If you look back at some of the tragic fires that have occurred across the world, history would surely show that many lives and properties may have been saved by a small amount of thought being given to the prevention of fire and to the reduction of the spread of flame; the use of simple and easy to fit fire sealing measures.

As early as 1667, King Charles 11 of England passed an Act, following the Great Fire of London that stated that the City of London should be rebuilt in sections, with each area having its own firefighting equipment. There were also regulations ensuring distances between buildings to prevent the spread of flames. Since then, we have come a long way in our fire safety procedures, but we still have many properties worldwide that unfortunately, are simply just accidents waiting to happen.

So how can we save lives and reduce energy loss by improving our construction methods? The logical way is to treat every segment of the property as a sealed compartment, and that means that any part of the building's fabric that has had sections removed to accommodate electrical fittings, pipes, cables, doors or ventilation ducting, are areas that should be considered as a fast-track route for fire and smoke to travel along and therefore, need to be sealed to retain integrity. When thermal and acoustic insulation is added to our homes and businesses, we should be aware that the energy saving and noise reduction elements of the product are only one aspect and therefore, to complete the second part, we must be sure that the product being installed is fire safe prior to fitting.

The emergence of the fire retardant coated or impregnated foam, for use as a compartment sealer will help considerably to minimise fires spreading out of control. It will consistently help to reduce large numbers of casualties and curtail severe property damage, not only to a fire ravaged building but also to adjoining or adjacent properties. The value of protective fire retardant coated or impregnated foam products cannot be underestimated in sealing off every potential avenue for flames or smoke to travel. This action will allow vital time for both the emergency services to extinguish the flames, and also ensure safe evacuation routes for the occupants. Unfortunately we are still seeing buildings being constructed in all parts of the world with the safety of the occupants taking a back seat in favour of other priorities, including the fixtures and fittings.

The introduction of pipes and services to any building project requires the instigation of a golden rule of fire protection, that is: "If you cut it, seal it". Too often through with the lack of basic training in the use of fire barriers, even the most competent tradesmen ignore simple fire stopping protection procedures and therefore, unwittingly increase the opportunity for a fire to spread. With the added problem of complicated building structures often requiring pipes and services to pass through fire walls at difficult angles, the need for a

Sure You Seal It

flexible and substantial fire barrier to accommodate these issues is vital to meet all current fire standards requirements.

If fire protective coated or impregnated foam is used to seal even the most complex areas, in a fire, lives could be saved, and property damage claims may be kept to a minimum. None of these methods are rocket science, but for it to work there needs to be a commitment by all building professionals to improve their knowledge and skills in the use of fire barriers, together with a high standard of inspection that needs to be maintained by qualified officials in the relevant authorities.

Once established that fire-stopping is important, then the use of a low-cost fire protective coated or impregnated foam is an extremely effective solution. The foam is very flexible and can be cut with a knife to fit a variety of shapes, providing an easy and effective way to seal both large and small openings, while offering an excellent thermal and acoustic barrier and a formidable defence against a fire. The foam can be used in a variety of applications, from sealing large service areas, multipurpose sponge boxes, under-floor fire barriers, loft insulation, under raised computer floors and behind rain-screens, and in conjunction with electrical light fittings. In addition, the flexible properties of the product make it the perfect candidate for use as an expansion joint between structures.

These fire protective coated or impregnated foams currently meet British and European Standards and are manufactured in the UK as a raw foam material. The base foam material is meets the full requirements of BS476 Part 6 & Part 7 Class O, but the foam is cut to size and impregnated with a special patented fire protective coating on one side to achieve in excess of two-hour fire integrity. It can also be coated both sides to achieve three-hour fire protection to BS 476 Part 20 1987 and EN 1366-3-2005 197-minutes and UNE-EN1363-1 2000.

Fire coated or impregnated foam has an added advantage, in that it can also be used as a thermal and acoustic barrier that will help to reduce energy loss, airborne and impact sound and will meet Document E of the UK's Building Regulation's acoustic requirements. The foam does not contain harmful fibres, which enables it to be used in many difficult environments such as hospital sterile areas, operating theatres, food preparation facilities and computer rooms. A Further advantage of the product is its density; in a fire this will greatly assist in the reduction of smoke penetration between rooms, which will speed up escape route procedures and avoid the risk of fatalities.

It can also be used as a cavity barrier to prevent a fire spreading upwards from floor to floor and also as a roof fire-break in terraced and semi-detached properties, to prevent several properties being attacked simultaneously. It can even be fitted as a liner to a conventional Upvc door to convert it to a fire door. The product is extremely light weight and can easily be cut to fit even the most difficult of shapes. In certain applications the product can be removed for both inspection and maintenance reasons, which allows it to have a multitude of purposes in safeguarding properties.

New construction and refurbishment projects often require a substantial degree of flexibility within a constrained budget, and fire protection solutions can sometimes be overlooked or even ignored due to lack of money, or the need to complete the project within an unreasonable time scale.

Sometimes there is a total disregard of the regulations even when a solution to the problem is at hand and could both be easy to install and cost effective to purchase. In some countries the regulations are completely flouted and standards of workmanship can vary immensely. In many cases iconic buildings across the world are still sadly lacking in basic fire prevention, where barriers have either been removed during alterations, or have never been fitted in the first place. Fire sealing procedures need to be classed internationally, as a top priority, and should be as important as energy saving considerations or the structure itself. In many new or refurbishment building projects the fire protection work is often undertaken only after an inspection is carried out by a building or fire protection professional, and so often the money spent on fire protection can be too little too late.

Without these vital important fire stopping procedures the safety of the occupants of the building and surrounding properties are compromised. Evacuation time is a precious commodity and if we are to save lives then we need to ensure that we build these values into the mix at the design stage and not just as an afterthought. The race is on in many countries to reduce energy loss and reduce impact and airborne sound. Many new properties now need to meet strict thermal insulation and acoustic guidelines, but sadly, all too often they fail miserably on their fire protection values. Saving energy and improving lifestyles are important, but not at the expense of saving lives!

In conclusion, the secret of the huge popularity of the fire protective coated or impregnated foam for fire stopping applications is attributed to the versatility, low cost and the simplicity and ease of installation of the product. , creating the ideal fire safety product to reduce deaths and injuries worldwide. IFP

Code Addresses Critical Asset Protection

Graham Collins

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BS 6266:2011 should be essential reading for anyone involved in the protection of business critical or mission-critical electrical assets. It is the recently introduced re-written revision to the Code of Practice for the Protection of Electrical Equipment Installations.

There are few businesses around today that are not reliant to one degree or another on electrical equipment. Indeed, many organisations are totally dependent on such installations for their very survival. Computer suites and servers, telephone exchanges and telecommunications centres, switchgear and control rooms are the "engine room" of many businesses as varied as banks and petrochemical facilities, Internet-based companies and hosting centres, utilities, logistics operations and mass transit organisations.

This has led to the increasingly common use of fire protection systems in electronic installations. Of course, this is not necessarily due to the high probability of fire, nor to it representing a significant hazard to life, but from the consequences to the business if the asset is damaged or destroyed. Indeed, the need to protect these electrical assets from fire has, in the past decade or so, become a major concern for many businesses. That being said, not all electrical equipment installations may be immediately evident. It is one thing to identify a major computer suite as being a candidate for protection, but what about the electrical control cabinet housed in the bowels of the building?

In the past decade or so, the consequences of the loss of essential electrical equipment have become a major concern for many businesses, resulting in increased awareness of the need to protect it from damage or destruction by fire.

The revised edition BS 6266 – a full revision of the Code, which replaces the 2002 edition – is therefore likely to become a well-thumbed document. It is complementary to BS 7974:2001 (Application of fire safety engineering principles to the design of buildings. Code of Practice) that gives a structured method for determining the most appropriate fire protection strategy for a building as a whole.

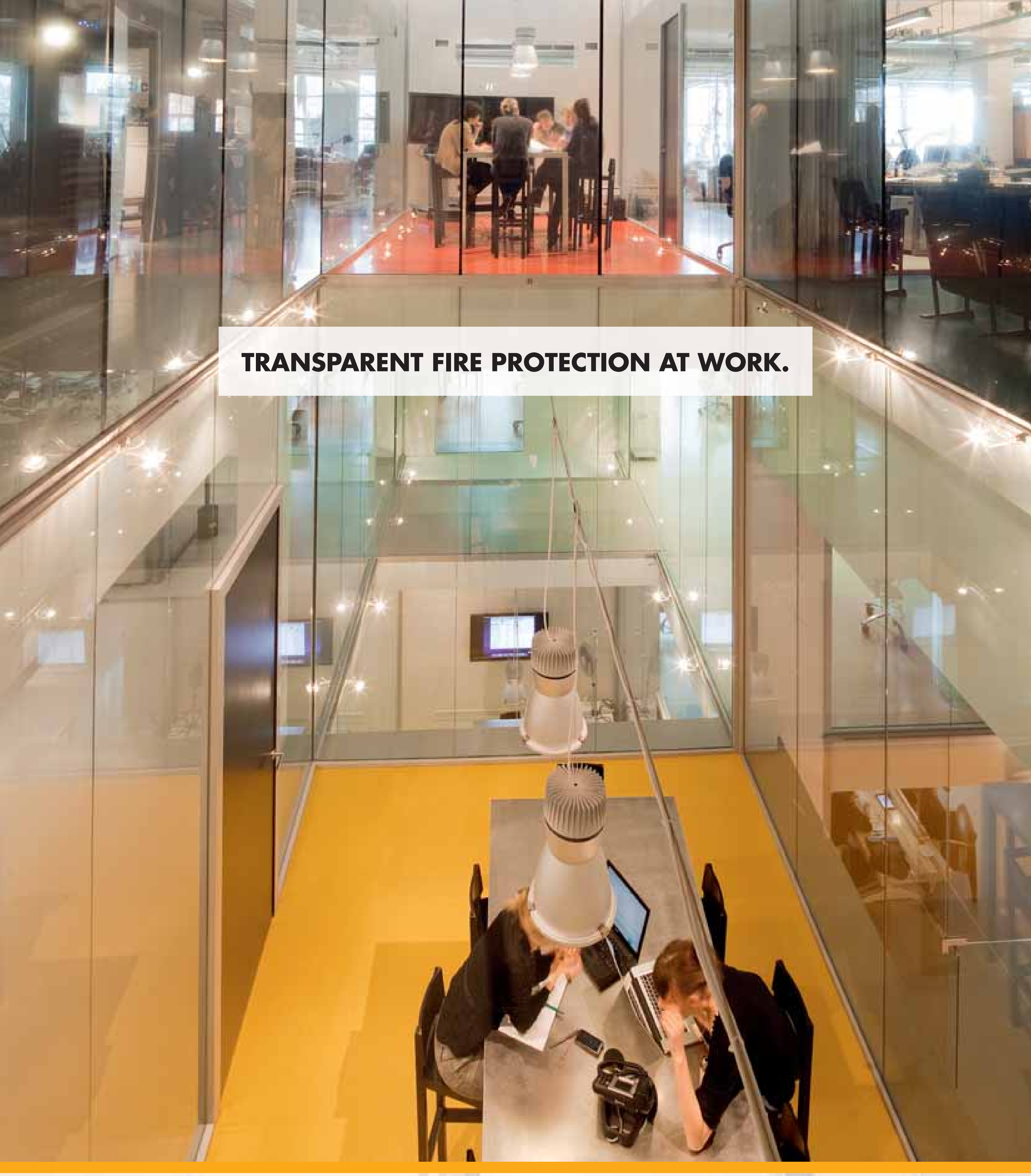
New Content

The revised Code of Practice covers both passive fire protection and active fire protection, fire detection and automatic extinguishing systems. It also provides more detailed information than the previous edition on the types of suppression systems available today and their suitability for protecting electrical and electronic equipment installations, taking into account the characteristics of the environments in which electronic equipment installations are located.

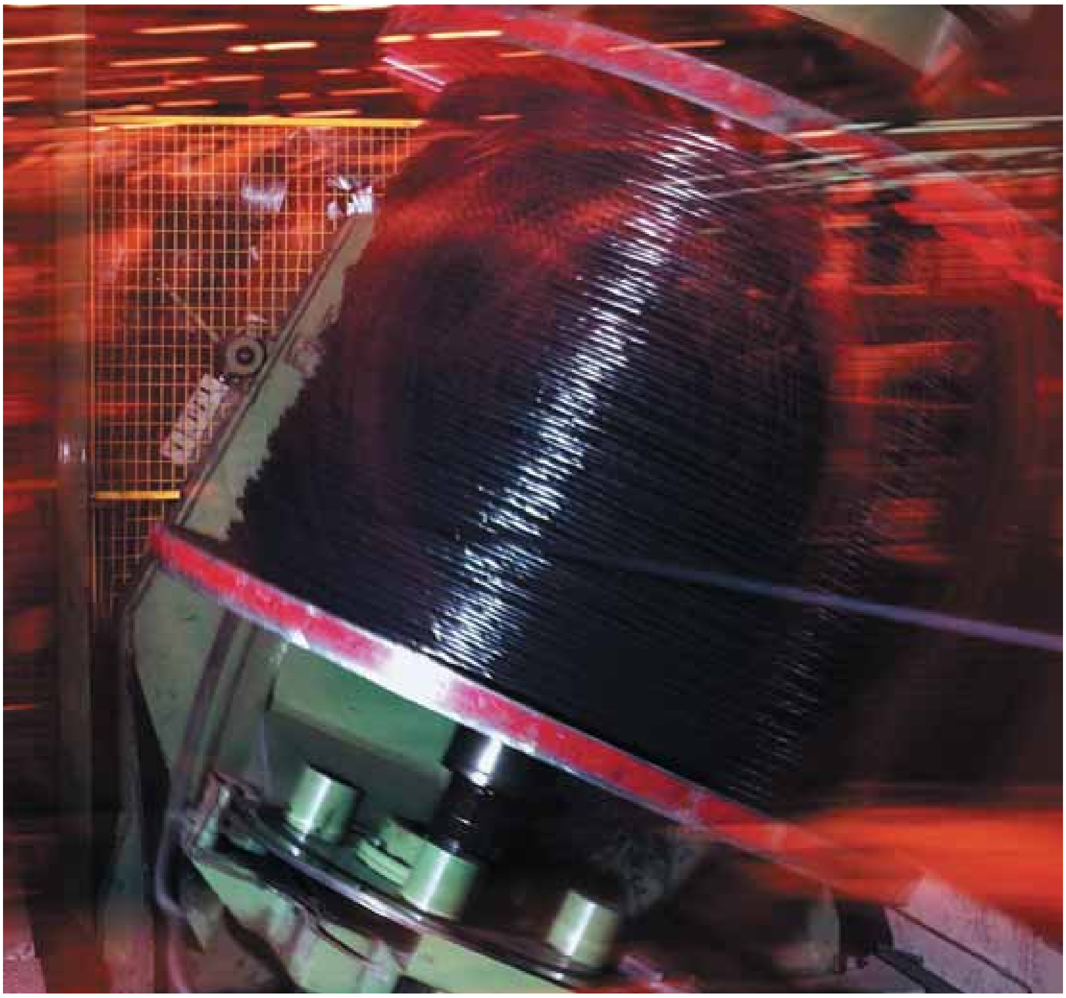
The Code of Practice includes a number of significant changes from the 2002 edition such as: a reduction from five risk categories to four, of which three are addressed in this edition of the Standard (significantly, this latest edition of the Code removes reference to "slight risk" environments); the reinstatement and updating of detection performance tests that were omitted in the 2002 version; updating of detection technologies that includes the classification of aspirating smoke detection systems; and the updating of structural fire protection provisions, taking into account of the publication of BS 9999:2008 (Code of practice for fire safety in the design, management and use of buildings). The challenges associated with detection in the high air flow environments that are a characteristic of many of these environments are also addresses in the Code.

Other aspects covered in the revised Code of Practice include: risk assessment and risk assessment categories; fire detection and fire protection strategy; building engineering services for electronic equipment areas; suppression systems; smoke control; fire safety management; and inspection, testing and commissioning.

BS 6266:2011 is available from the BSI shop at http://shop.bsigroup.com. IFP


TRANSPARENT FIRE PROTECTION AT WORK.

Choosing Fire-rate Simple Matter



Choosing a fire-rated cable is simple, right? No, it calls for constant vigilance. Sadly, not every cable "does what it says on the tin"; the pedigree of some cable is highly suspect; and standards and codes of practice are not always applied with the diligence they deserve.

Toby Collins

Draka UK

Three quality issues face the specifier and installer of fire-rated cable. They are by no means new challenges, and they respect no national boundaries. Cable without proper marking on the outer sheath means having to rely on the claims made by the provider or manufacturer as to its standard and origin; the installation of sub-standard or counterfeit cable means accepting a serious risk of fire with potentially life and property threatening consequences; as does installing cable that does not comply with the required performance or test standards.

Reputable cable manufacturers around the world invest heavily in research and development, endlessly testing new materials and cable designs and having their cables independent third-party approved by reputable organisations such as BASEC [British Approvals Service for Cables] or LPCB [Loss Prevention Certification Board]. Additionally, in-house testing goes on all the time to ensure that cables comply with the appropriate British, European and international standards and codes of practice.

Cables are designed and tested for their fire properties against whichever is the appropriate standard, as many safety-critical systems such as emergency lighting, fire detection and alarm installations, automatic fire suppression installations, smoke control and ventilation and firefighting lifts are designed to have very specific levels of performance during a fire and require precise fire survivability characteristics.

But what, in general terms, is this research and testing aimed at ensuring? The three main tests

d Cable is No

carried out on fire performance cables aim to establish the particular cable's fire resistance, its flame propagation, and its emission of smoke.

The fire resistance test, as the term implies, assesses the cable's integrity in a fire. In other words, it measures the length of time that the cable would continue to function under set fire conditions. Some are designed for fire survival times of 30 minutes, some for 60 minutes and some for the highest 120 minute rating. Impact tests, where a metal rod repeatedly strikes the cable being tested, imitates falling debris in a burning building, while blasts of water mimic the impact of water from fire suppression sprinklers or firefighting hoses in a fire. This is known as integrated testing.

Flame propagation testing identifies the spread of flame from the point at which the fire started, and tests ascertain how far a cable burns before it stops burning. For this test, the cable is run vertically inside a fire testing chamber to replicate installation in a building. For smoke emission tests, a cable is placed in what is called a smoke cube. This cube has a light source at one end and a light sensor at the other. The cable is then set alight and emits smoke into the cube. The drop in the amount of light travelling from the light source to the light sensor is calculated and must not drop below a test-specific percentage.

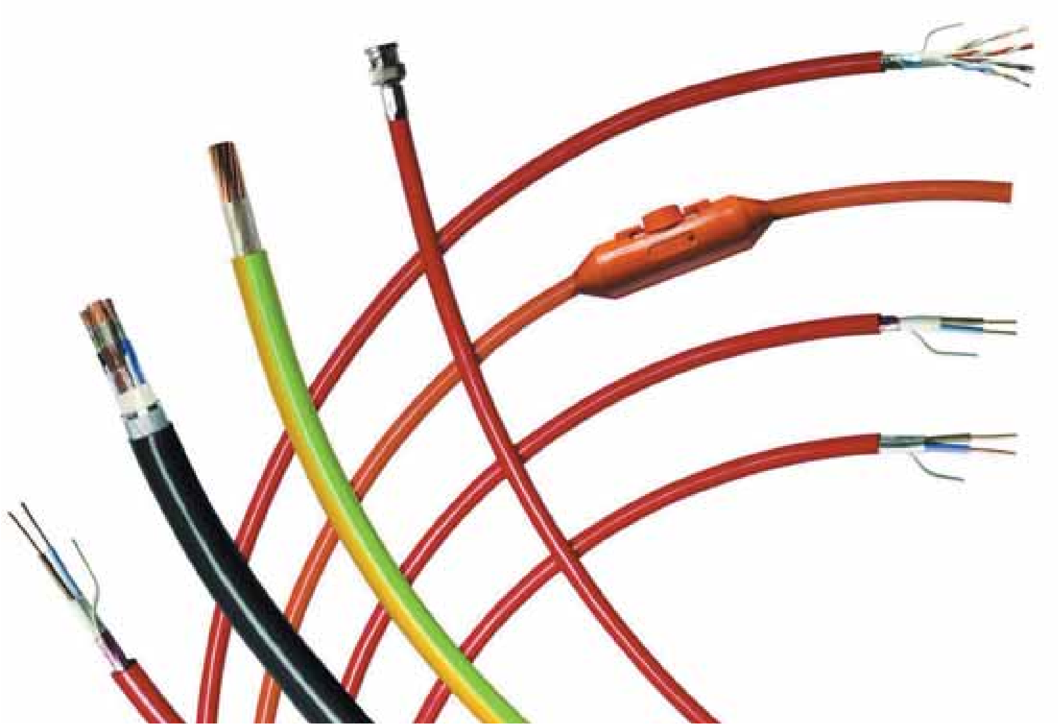
So, reputable manufactures devote considerable time, expertise and money to make sure that cables are safe and fit for purpose. It is not somewhere to cut costs, any more than it is somewhere that installers should cut corners by using anything other than tested and approved cable – cable that are also appropriately marked and meets the required standards for the particular application.

Essential Cable Marking

So, what is the problem with opting for cable without the appropriate marking on the outer sheath? In short, without the proper markings there is no means of establishing the cable's authenticity. Indeed, in the absence of such marking there is every probability that the quality and performance of the cable is highly suspect and is from a disreputable supplier. It is a problem that should concern everyone in the supply chain, from specifiers right through to building control officers. Depending upon the particular application, there is in the UK for example, a legal obligation to include certain information; the more demanding the specification, the more information is required to be shown on the cable.

Without proper markings on the cable it is impossible to know whether you can trust that it is safe to install. This is not just an issue at the initial installation stage, it also a serious concern when circuits are later modified. Fitting poor quality cable can have lethal implications and leave the installer liable to prosecution.

Among the markings that should be clearly visible on every cable in the UK are the manufacturer's name and the British Standard number to which the cable claims to conform. Providing the cable has been tested by one, the name of the independent third-party approval organisation should also be included. However, merely stamping a BS number on a cable is not evidence that it actually complies. Without third-party approval there is absolutely no guarantee that any of the claims made for the cable are true. Even if a



third-party approval organisation's name is marked on the cable, if there are any doubts whatsoever, the marking's validity should be checked with the third-party approval organisation.

The Counterfeit Cable Plague

The failure to carry proper markings is a good indication that the cable is, in all probability, a counterfeit or sub-standard cable from a rogue manufacturer.

Installing such cable is tantamount to installing a "ticking time-bomb" and is such a serious concern that in 2010 Approved Cables Initiative (ACI) – an industry-wide working group – was formed to publicise the threat and co-ordinate efforts to stamp it out (www.aci.org.uk). Despite the sterling efforts of ACI, other concerned organisations such as BASEC, and the leading reputable cable manufacturers, counterfeit cables are still cropping up far too frequently.

Ironically, the very fact that there are standards and regulations that bona-fide cable manufacturers adhere to can actually help the counterfeiter to dupe the unsuspecting distributor, installer or fire engineer. These rogue manufacturers and suppliers are only too happy to lay spurious claim to standards; unwarranted BS, EN or other acknowledged international standards are often found displayed on the rogue cable sheathing.

Currently, sub-standard cable can be found where the diameter of the copper wire has been reduced, lowering the current rating and increasing the resistivity of the cable. There have also been numerous instances where materials other than pure copper, such as steel wire, copper-coated aluminium or badly recycled copper have been used in cables, and instances where the insulation or sheathing is sub-standard are also all too commonplace.

So, what can – indeed should – be done? It starts with everyone in the industry being involved and accepting their legal and moral responsibilities. The first step is to verify that what you are being told or shown is not misleading, incorrect, or simply downright dishonest. However, relying on the manufacturer's or supplier's assertions that a cable is manufactured to a specific standard simply will no longer do; ask for copies of test or membership certificates. Better still, insist on using only cable that is supported by independent test certification by fully accredited organisations.

The importance of this third-party accreditation lies in the fact that the specifier, the supplier and the installer can be sure that the cable being supplied today is made to precisely the same standard and specification as the cable that was originally tested and approved. It is worth reiterating, if the cable is from a producer that does not have this third-party accreditation there is, in reality, no guarantee of the claims being made for it. This requirement for third-party accreditation is important even when buying cable from a well-known manufacturer. Without it, while earlier cable from that supplier may have been up to the standard claimed for it, re-sourcing materials and accepting a different specification, changing the formulation of the coating or sheathing, or modifying the design may have affected the performance of the cable.

It is important though to remember that rogue cable manufacturers are every bit as willing to fake third-party accreditation as they are BS or EN standards so, at the risk of repeating myself, always check with the accreditation organisation that the claim is genuine.

Ensuring Compliance

The ever-increasing volume of legislation surrounding the selection and installation of fire-rated cable has undoubtedly made the task of cable selection more demanding. This is not always helped by misinterpretation or misguided advice given by some manufacturers or supply channel partners.

Take, for example, the case of BS 8519:2010 (Selection and installation of fire-resistant power and control cable systems for life safety and fire-fighting applications. Code of practice). It came into being due to the increased size, height and complexity of the active fire protection in many high-rise and complex buildings and the adoption of fire

engineered solutions. These solutions demand a high level of reliable performance from building services, including the electrical supplies. However, its introduction led to a number of misleading claims being made for some cables, with the confusion appearing to have arisen from a misinterpretation of the different test methods required for power and control cables. While the Code of Practice is finally becoming more widely understood and adopted, it illustrates how confusion arises.

BS 8519:2010 covers the selection and installation of fire-resistant power and control cable systems for life safety and firefighting applications, and calls for power cables to be tested in accordance with BS 8491:2008 (Method for assessment of fire integrity of large diameter power cables for use as components for smoke and heat control systems and certain other active fire safety systems). The Standard makes clear reference to three categories of circuit that are required to maintain their integrity under defined fire conditions for fire survival times of 30 minutes, 60 minutes and 120 minutes. Appropriate cable tests are identified for each category, giving the relevant British Standard for the assessment of cable performance under fire conditions that might be expected in an actual incident.

Nevertheless, cables were soon being promoted as complying with the Standard as being suitable for power applications that had not been ratified in accordance with BS 8491. These cables had been tested in accordance with BS EN 50200:2006 (Method of test for resistance to fire of unprotected small cables for use in emergency circuits) and so were suitable only as control cables. There are though cables that meet the power cable requirements of BS 8519, one of which is Draka's FTP120 – until recently called Firetuf Powerplus – a third-party approved SWA (Steel Wire Armoured) power cable that achieves BS 8491's highest integrated-testing 120-minute rating.

As a Code of Practice, the aim of BS 8519:2010 is to encourage best practice and takes the form of guidance and recommendations. However, care should be taken to ensure that claims of compliance are not misleading, as any company claiming compliance with a Code is expected to be able to justify any actions that deviate from the Code's recommendations. IFP

Toby Collins is Sales Director – UK and Ireland at Draka UK

For further information, go to www.drakauk.com

Ho Chi Minh City's

No structure best depicts affluence and wealth than a high-end, luxury retail complex. The Crescent Mall in Vietnam is the latest addition to a development set to have a huge impact on the infrastructure of Ho Chi Minh City.

Bill Benbow

Cooper Safety

It is true to say that customers at Vietnam's biggest shopping centre are going to be treated to five-star fire protection as well as a lavish, luxury shopping experience. The new five-story Crescent Mall, which forms part of a multi-complex development at the heart of a new and modern city, has officially opened, complete with the latest in fire and safety control.

Located beside Lake Crescent, within Phu My Hung in District 7, the $200 million Crescent development offers 45,000 square meters of prime retail space, 300 premium-serviced apartments, 10,000 square meters of international standard office space and 22,000 square meters of waterfront retail space. This multi-use development is fast becoming the heart of Phu My Hung's new city centre.

Phu My Hung Corporation, one of Vietnam's leading developers, started development of the 409 hectare Phu My Hung New City Centre over 20 years ago as a vision for a thriving modern city. The execution of the Saigon South master plan – the first multi-complex development in Ho Chi Minh City – has made this district become one of the most desired living destinations in Ho Chi Minh City; it is currently home to over 10,000 households.

Growing Economy

As Ho Chi Minh City changes and decentralises, District 1, the city's traditional shopping area is losing its status as the location for shopping malls in the southern region. Developments like the Crescent look certain to become more commonplace as the country's wealth grows.

Retail sales in Vietnam have steadily grown over recent years and as GDP continues to increase, retail outlets are evolving to meet the demand of a population with a growing amount of wealth. A recent report from HSBC predicts that Vietnam will become one of the top 50 economies in the world over the course of the next few decades, predicting that the size of the economy will expand to $451 billion by 2050.

Building Regulations

One of the most important industries in Vietnam is construction, particularly as urbanisation is fast expanding in areas like Ho Chi Minh City and Hanoi. With that in mind, the construction industry and, in particular, safety legislation has dramatically improved.

While equipment and materials being used by the construction industry are in the most part set to international standards, Vietnam's building regulations are a harmonization of a number of different international codes. The influence of the United States is still strong, as the dominant building code is the American National Fire Protection Association (NFPA), but there is also an influence from Singapore building codes and Australia's AS codes.

Crescent Mall

Shopping Centre Fire Safety Challenges

Shopping centres, like any retail centre, face substantial public liability for a whole host of risks, from accidents and trips to the risk of fire. Fire in particular is no stranger to shopping malls worldwide and in 2002 Ho Chi Minh City played host to one of its most deadly peacetime disasters, the International Trade Centre fire.

The award winning International Trade Centre is an upscale mall with over 400 shops and restaurants and was, at the time, the sole-outpost for high-end designer stores in Vietnam. It was set ablaze following stray sparks from a welder's torch as work was carried out in the upper level nightclub, inside the building. There were an estimated 1500 people shopping in the mall at the time of the fire, which claimed 60 lives, while 120 people suffered injury.

This incident highlights the need for adequate fire and safety control and the benefits of these controls should not be in any doubt in large, complex, multi-occupancy buildings such as a shopping mall. It should also be clear that fire safety and smoke control systems should not just be restricted to maintaining smoke-free staircases and lobbies. With modern building designs, voice alarm systems, emergency lighting and smoke control systems all have a vital role to play in the total fire protection model.

From a fire protection perspective, shopping malls are generally the most complicated of retail structures, requiring a fire alarm system sufficiently intricate to provide communication between any number of active systems.

From a fire protection perspective, shopping malls are generally the most complicated of retail structures, requiring a fire alarm system sufficiently intricate to provide communication between active systems such as, zoned sprinklers, smoke control provision, secondary power supplies, emergency lighting and manned control centres.

The Crescent Mall, like any other retail outlet of its size poses a number of challenges all of which need to be considered in the design process; from egress systems, to the complexity of the fire detection system to ensure the maximum safety of customers and occupants and to maintain the integrity of the building where possible. The systems at the Crescent Mall will protect the thousands of customers that are expected to walk through the mall's doors each day.

Fire Safety at the Crescent Mall

The Crescent Mall is typical of a modern shopping centre and involves the installation of a number of systems, many of which operate in conjunction with each other in the event of a fire- related emergency.

The fire detection and notification systems in the Crescent Mall have been designed to the Singaporean standard CP10. This standard originates from the widely accepted UK fire standard, BS5839. The design utilises a networked series of intelligent addressable panels together with a combination of intelligent addressable smoke and heat sensors, call points and interfaces that integrate a range of building services, such as the air conditioning, fire dampers and sprinkler systems into a cohesive fire detection and fire protection system. The design was carried out by SPCC, the in-house design operation for the Phu My Hung developer.

In general the mall area is protected by intelligent addressable point-type optical smoke sensors, with dual heat/smoke sensors in electrical rooms and heat sensors in the basement car park areas. The mall is also fitted with break-glass call points and visual notification strobes. The detection system is interfaced with a voice alarm system so that, in the event of a fire in any one zone, the system broadcasts a message to that zone plus the adjacent zones. The adjacent zones may well be a different fire compartment either on the same level or levels above and below. The system extends into the tenant shop areas and the system is altered to accommodate the tenants' fit-out design.

The system comprises eight 4-loop rack mounted controllers, internally networked. The entire system operates in Vietnamese. This allows local security staff to operate the system in the comfort of their natural language. The system monitors the sprinkler flow switches and status of the fire pumps. In addition, controls the fire dampers, air conditioning and gas supply across the global cause and effect matrix.

Life Safety Systems

In shopping centres and retail outlets, building regulations stress the importance of the provision of life safety systems. The Crescent Mall has a design occupancy of 15,000 people and this can represent a high risk when considering the number of people distributed throughout the building at any one time.

Evacuation time for shopping centres can be lengthy. Much depends on the efficiency of the staff to manage the evacuation process and a life safety system that includes a number of elements; fire-detection systems, including manual call-points, electronic smoke and heat sensors that activate audible alarms and that can be programmed to automatically notify local fire departments. For fire suppression, hand-operated fire extinguishers and sprinkler systems should be part of the overall system. Smoke is as dangerous as fire, so a well-designed smoke control system

should be provided to maintain smoke-free escape conditions to allow the building to be evacuated with minimum risk of smoke inhalation. Protective measures include the automatic shutdown of ventilating systems and elevators and the division of the building into areas that are free from smoke. Occupants evacuate through smoke control protected exits.

The need to evacuate only the area of the mall affected by fire has resulted in an intricate system to ensure that fire can be detected in the early stages, the right areas are evacuated and the right systems are in the right part of the building. For example, smoke curtains and smoke extract operate to maintain the 'open' mall area as a place of comparative safety.

The "cause and effect" plan was agreed during the design process, and is developed from an agreed life safety system. This plan was agreed with local building control, and is designed to be robust throughout the life of the mall. Any deviation from, or change to, the plan should not be made without proper consideration being given to the affect that any such deviation or change would make to life safety.

Building to international standards is becoming easier in developing countries, aided by the growing infrastructure and a better understanding of building codes. Systems are being developed and produced in local languages, which aids the security of customers and staff managing the building.

A large development like the Crescent Mall poses a variety of risks and challenges. Guidance from the international fire community and experienced suppliers ensures the safety and longevity of the building and those who use it. While international manufacturers supply into emerging markets such as Vietnam, the challenges to complete projects, such as the Crescent Mall, are substantial.

For fire suppression, hand-operated fire extinguishers and sprinkler systems should be part of the overall system. Smoke is as dangerous as fire, so a well-designed smoke control system should be provided to maintain smoke-free escape conditions to allow the building to be evacuated with minimum risk of smoke inhalation.

Training of the contractors is key and appointing a local distributor is essential to ensure language and cultural differences do not inhibit the completion of an important part of the building services. For example, MP Co., the local distributor for the Crescent Mall, employs engineers certified by Cooper who then project manage the installation and commissioning of the system. As emerging markets develop, and local skill levels lag that of developed countries, an active involvement from concept design to final commissioning with local contractors and designers ensures this development meets the international standards and offers the protection expected in such a major development. IFP

Bill Benbow is Asia Director for Cooper Safety

For further information, go to www.cooper-safety.com

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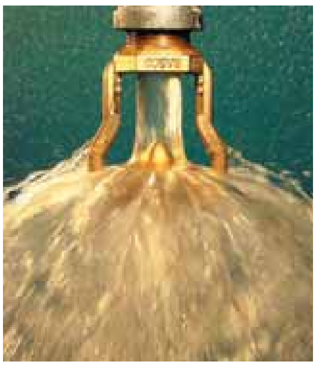

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A Part to Play

Sustainability is a topic that I seem to touch on often in the *From the Editor* pages of International Fire Protection and its sister publications, International Fire Fighter and Asia Pacific Fire. Certainly it is a word that gets bandied about in industry generally and in the fire protection industry in particular.

I say "bandied about" because I have sneaking suspicion that it is, or may soon become, devalued to buzz word status, to be used in promotional material without too great a prospect of being challenged. But why do I raise it now?

Two things prompted me, both coming my way via press releases. The first was a press release that landed in my email inbox a few days ago outlining the sustainable achievements of one fire industry manufacturer; the second was a press release relating to a report on sustainable prosperity and what could be taken as being our inability to achieve it.

What struck me most about the first press release was that, for the first time in my tenure as group editor of the three MDM Publishing titles, a company has actually spelt out in a press release, in facts and figures, precisely what it has attained in terms of carbon reduction, recycling and sustainability. This contrasts with the norm, which is either merely to append the word "sustainable" to a description of the product being promoted, or offer it as an attribute without any tangible evidence. You will find the press release that caught my eye in the news pages of this edition.

What was most noticeable about the second release was the scale of the sustainability problem that the report was highlighting. The report from the Worldwatch Institute in the USA – entitled *"State of the World 2012: Moving Toward Sustainable Prosperity"* – makes sobering reading. For example, it points out that the construction and the operation of buildings use between 25 percent and 40 percent of all produced energy, accounting for a comparable share of global carbon dioxide emissions. It goes on to contend that we must aim for net zero energy use, zero emissions, and zero waste if new construction and existing buildings are going to be genuinely sustainable.

Another finding of the authors' research is that, over the past 50 years, the world's middle and upper classes have more than doubled their consumption levels, and an additional one billion to two billion people globally aspire to join their ranks. More than half of the world's population lives in cities, and 90 percent of urbanisation is occurring in the developing world. At the same time, poverty is expanding in both the developed and developing worlds, with some 828 million people living in slums worldwide. Inevitably, and understandably, these dispossessed people will continue to strive to enjoy a greater share of the good life, generating further pressure on the earth's resources. Sustainable it is not, certainly not in the way that we are currently going about things.

The construction and the operation of buildings use between 25 percent and 40 percent of all produced energy, accounting for a comparable share of global carbon dioxide emissions. If new construction and existing buildings are going to be genuinely sustainable they must aim for net zero energy use, zero emissions, and zero waste.

Politicians are, of course, a soft target when it comes to issues such as carbon emissions, sustainability and environmental impact. But each and every one of us has a part to play if we are to pursue true sustainability. The starting point for manufacturers is obviously to review the true sustainability impact of their raw material sourcing and usage, their manufacturing processes, products' reliability and the proven life expectancy of the components and systems they are producing. The next step is then to move from hype to quantifying precisely what this means with hard facts and figures, stating clearly what moves are being taken towards improved sustainability. They should be encouraged in these endeavours by fire engineers asking for flesh to be added to the skeleton of any supplier's sustainability claims. IFP

Fire Detection Added to Camera's Capabilities

OPGAL OPTRONIC INDUSTRIES, a provider of thermal imaging and near infrared illumination solutions for security and safety applications, has added long-range fire detection and fire risk assessment capabilities to certain of its EyeSec line of uncooled thermal cameras. This, the company claims, makes it the only camera manufacturer to deliver an application-specific embedded fire detection video algorithm that can sense a fire and provide an automatic safety and security notification of the event.

Available with a wide variety of lens options, the camera is aimed at facilities storing flammable materials, transportation tunnels, combustible storage areas, and perimeter sites located near flammable forests and greenery that are sensitive to fire danger. With the EyeSec camera, these sites can now deploy an automated fire detection and alert tool that provides an additional layer of site safety integrated into a security and surveillance system.

With its flame detection capability enabled, the camera can detect a 750mm by 750mm fire as far away as 840 meters within five seconds, with detection ranges increasing for larger-sized fires up to six metres by six metres and distances up to 6.5km, day or night. Setting up a temperature threshold, the camera scans the area of interest and alerts when any object in its field of view reaches a critical temperature; for example, when factory machinery reaches dangerous temperatures.

For more information, go to www.opgal.com

Cable Cleat Gets Approval

Cable cleat manufacturer, ELLIS, has received London Underground (LUL) approval for its Phoenix range of fire-proof cable cleats. Designed specifically for installation with fire-rated cables, the cleats are manufactured in 316L stainless steel, are fire-proof and corrosion resistant and provide an effective method of safe cable restraint.

The range was granted full LUL 1-085 approval and has been added to the London Underground Approved Products Register.

For more information, go to www.ellispatents.co.uk

Detectors Protect Kashagan Oil Rig

New fire detection systems within the utility and accommodation areas at EPC2 and EPC4 drilling islands in the Kashagan oil field in the Caspian Sea utilise HOCHIKI EUROPE'S hazardous area products, including 276 of its SLR-E-IS intrinsically safe photoelectric smoke detectors, which incorporate a remote indicator output and a removable chamber for easy maintenance.

The SLR-E-IS detectors feature a design of optical chamber that Hochiki says minimises the differences in sensitivity experienced in flaming and smouldering fires, creating a high performance solution that is equally responsive to all smoke types.

SDP-2 duct probe housings were also installed, allowing some of the SLR-E-IS devices to be mounted on the outside of air ducts. Using an aspirating technique, the air within the duct is drawn via a pipe into the probe's housing, allowing constant sampling which, in turn, makes smoke detection within the duct simple, effective and easy to maintain. DCD-1E-IS conventional intrinsically safe rate of rise heat detectors with a 60°C fixed temperature element and CCP-E-IS intrinsically safe conventional manual call points completed the installation.

For more information, go to www.hochikieurope.com

University's Key Assets Protected

The Imam Muhammad ibn Saud Islamic University in Riyadh, Saudi Arabia, which houses ten faculties and currently has more than 24,000 students and 1,300 faculty staff has protected its vital electrical equipment housed in cabinets throughout the Engineering Department with FIRETRACE INTERNATIONAL'S Firetrace automatic fire detection and suppression.

A total of 54 of the Firetrace intrinsically safe systems, upon which the effective day-to-day operation of the university depends, have been installed in six rooms at the university to provide around-the-clock, unsupervised protection that requires neither electricity nor external power.

Each system comprises a cylinder containing the suppression agent – in this case 3M Novec 1230 Fire Protection Fluid – that is attached to specially developed leak-resistant polymer tubing. This proprietary Firetrace Detection Tubing is a flexible, linear pneumatic heat and flame detector that is routed throughout the electrical cabinets. Immediately a fire is detected the tubing ruptures at the point where the heat is detected, automatically triggering the release of the suppression agent, suppressing the fire in less than ten seconds.

Prior to installing the Firetrace systems, the only fire protection provided in these rooms was conventional ceiling-mounted smoke detectors. "These were totally inadequate because, by the time a fire in a cabinet had been detected by a smoke detector, the equipment in the cabinet would in all probability have already been extensively damaged or destroyed by the fire," according to Husam Sinjab of specialist fire protection company, Saudi American Modern Systems.

For more information, go to www.firetrace.com

New Cable Fixing

Specialist trunking company, D-LINE has introduced a range of semi-circle-shaped surface cabling solutions that satisfy British Standard requirements and meet the aesthetic demands of modern buildings. A new FCLIP satisfies BS5839 Part 1, which demands that fire performance cables must be secured by fixings that can withstand the same heat as the cables, so ensuring that the circuit integrity of the cable can be maintained during a fire.

The FCLIP fits neatly and simply into the D-Line mini trunking base. Installers drill through the FCLIP to screw-fix both the clip and trunking to the surface. Fully safety tested, the FCLIP can hold two 1.5mm two-core fire performance cables. The FCLIP can also be put in different positions within the 30mm trunking base before being permanently fixed, which helps meet cable manufacturers' requirements of fixings being at 300mm intervals for horizontal runs and 400mm for vertical drops. The trunking is self-extinguishing, but even after its melting point the FCLIP can withstand the same temperatures as the fire-rated cables, which ensures there are no dead alarm sounders, or live cables hanging loose if a fire was to occur.

For more information, go to www.d-line.co.uk

Sustainability in Action

The latest carbon reduction and sustainability figures from CHUBB FIRE & SECURITY UK show that over the last seven years, the percentage of each extinguisher unit recycled was significantly increased, from 40 percent to 90 percent. This was achieved primarily at the company's recycling plant at Hams Hall in the UK.

This compares with 2004, when only 40 percent of the 9000 extinguishers taken to the recycling centre each week was recycled; 100 percent of the 8000 litres of liquid waste each week, six metric tons of powder waste each week, 30 metric tons of waste, excluding liquid and powder, each month, and overall 120 metric tons of waste per month, was sent to landfills.

Chubb now recycles 97 percent of the 500,000 extinguishers received every year; zero waste is now sent to landfill from Hams Hall and many of the recovered materials go to help the wider community in the manufacture of kerbstones and rubber flooring products.

For more information, go to www.chubb.co.uk


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NFPA Conference & Expo: a Must-attend Event

11th to 14th June – Las Vegas

Every year, thousands of fire, electrical and building safety professionals from around the world attend the NFPA conference & Expo. What do they know that keeps them coming back?

They know there is no better place to spend time when they are looking for ways to do a better job, update their knowledge, solve a problem, save money and, in general, show their commitment to a very important shared mission. That mission has been the NFPA's for more than a hundred years – reduce the pain, suffering, and financial burden created by a fire, an explosion, or an unsafe electrical discharge.

Who is the NFPA?

The NFPA is the world's leading advocate of fire prevention and an authoritative source on public safety. NFPA develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimise the possibility and effects of fire and related risks; codes and standards that influence every building, process, service, design, and installation in the U.S. and many other countries.

These codes have been developed by its members and other industry stakeholders over the course of the association's 115 years of concerted effort, and are continuously refined through research, training, communication, and a robust consensus-building process.

The annual event, NFPA Conference & Expo, plays a key role in developing and disseminating code information through a comprehensive technical program, and for the ever evolving consensus codes, the Association Technical Meeting where revisions, motions, and consent documents are presented and voted upon.

Conference Program

The 2012 conference offers more than 130 educational sessions, divided into twelve tracks to help attendees identify sessions that best meet their needs.

- **Building & Life Safety (17 Sessions)**
  Technologies, best practices, and statistical data

For further information, go to www.nfpa.org/conference

needed by designers, engineers, and building and fire officials responsible for plans review, inspections, and other building-related tasks.

- **Codes & Standards (33 Sessions)**
  Expert guidance on the practical application of NFPA codes and standards, as well as information on recent updates and changes.
- **Detection & Notification (11 Sessions)**
  Code requirements and design issues affecting the application of new technologies in alarm and signalling systems, and the impact of maintenance on systems performance.
- **Electrical (16 Sessions)**
  Best practices in the electrical industry and how they are influenced by new electrical design issues, successful maintenance programs, effective inspection techniques, and safety programs.
- **Emergency Preparedness/Business Continuity (18 Sessions)**
  The latest methodologies for accurately assessing risks and consequences, emergency preparedness, contingency planning, incident management and recovery capabilities.
- **Fire & Emergency Services (40 Sessions)**
  A look at what is new in firefighting technology, safety preparedness for first responders, incident command strategies, and fire prevention and inspection techniques.
- **Fire Protection Engineering (9 Sessions)**
  Ideas for meeting fire protection challenges using computer modelling, field testing, post-incident analyses, and other methods for developing performance-based building solutions.
- **Fire Suppression (19 Sessions)**
  The importance of proper design, installation, inspection, testing, maintenance, and plans review on sprinkler system effectiveness.
- **Green (7 Sessions)**
  How environmentally-friendly initiatives affect the design, maintenance, and testing of fire and life safety systems and components.
- **Loss Control/Prevention (15 Sessions)**
  Strategies for mitigating risk through accurate assessment of occupancy and commodity classification, enhanced reliability of fire protection systems, and other risk factors.
- **Public Education (13 Sessions)**
  New planning strategies and creative solutions for meeting the challenges of effective public fire and life safety education.
- **Research (20 Sessions)**
  The latest research into critical fire and life safety initiatives, including the reliability of emerging technologies.

Record-setting Exhibition

Alongside the conference programming is a three-day product exposition that, in 2012, is expected set a new record in terms of the number of exhibiting suppliers and square meters of exhibit space.

Over three hundred exhibitors will be demonstrating the latest products, technologies and equipment for fire prevention and suppression; alarming and mass notification; system design and installation, testing, maintenance; and enhancing life safety measures.

Viva Las Vegas

The NFPA Conference & Expo travels in a multi-city rotation and is held in Las Vegas on even-numbered years. The 2012 event in Las Vegas offers not only the knowledge-based benefits of attending but opens up an incredible world of entertainment and recreation options outside of event hours.

The official venue, Mandalay Bay Resort and Casino, offers unmatched luxury, fine dining, renowned entertainment, personal service, and gaming excitement. Where else can you explore eleven acres of beachfront bliss in the middle of a dessert? Further up the strip, you can venture into some of the most incredible resorts in the world, see big-name entertainers, and thrill to mystery, intrigue, anticipation, colour, acrobatics, music and more when you choose from not one but six different Cirque du Soleil productions.

If outdoor adventure is more your style you will see stunning views of the Grand Canyon with a tour by either coach bus or helicopter. Want to get physical? Sign on for a water rafting tour down the mighty Colorado River.

Register and Book Your Hotel

You can register in advance at www.nfpa.org/conference. The exhibition is free when you pre-register. Mandalay Bay is a popular resort destination, so you are encouraged to book your reservation ASAP.

We hope to see you in Vegas this year. IFP


We're raising the bar.
Again.
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Europe
Middle East
South America
Africa
34.5
25
bar

Beam Detector Offers Reduced Cost of Ownership

SYSTEM SENSOR EUROPE has upgraded its Series 6500 intelligent beam detectors by porting the digital advanced protocol, which is said to improve performance and reduce the total cost of installation and ownership.

Each 6500 Series detector protects up to 1500 square metres, making it effective in protecting shopping centres atriums, concert halls, historic buildings, warehouses and other large areas with high ceilings. The System Sensor advanced protocol identifies the product type to the panel, reducing configuration time. It supports up to 159 detectors and 159 modules on a loop, reducing cabling costs; remotely controllable isolation is built-in to reduce cable fault-finding time.

Access to the processed and raw sensor data enables trend logging and maintenance intervals to be optimised for maximum efficiency. It also enables the control panel to remotely change the sensitivity setting and implement remote testing from ground level, saving cost when commissioning and during routine maintenance. The 6500 Series has four fixed and two automatically variable sensitivity settings, enabling it to be optimised to the operating environment. Loop and externally powered intelligent versions are available, as are conventional units. The 6500S features the AssureTest remote test capability that fully tests both the optics and the electronics of the device without having directly to access the unit. A filter is electro-mechanically introduced into the optical path, attenuating the beam and causing the unit to go into alarm. This test process provides a complete check of every component in the alarm path without the need for access at high level.

For more information, go to www.systemsensoreurope.com

New Range of Power Supply Units

An extended range of EN54-4 approved and general use power supply units and chargers has been launched by VIMPEX.

The K25000 series provides a stable and fully regulated, true 24 Vdc output for fire alarm system applications under all power conditions. The regulation techniques ensure that even when running on standby batteries, a stable 24 Vdc supply is available to all parts of the system. The powerful onboard micro-controller ensures that all battery types are conditioned with optimum, temperature-compensated charging algorithms to maximise battery life and maintain batteries in top condition.

Vimpex power supplies are available with either 2.5 amp or 5.25 amp output and can be fitted with optional dual-fused output monitoring modules. This ensures compliance with European standards when supplying fire control panels with an external power supply. An optional dual output path version is also available that provides two independent supply paths between the power supply unit and the control panel in accordance with EN54-4 clause 6.4 and BS5839 pt1, clause 12.2.2.m.

For more information, go to www.vimpex.co.uk

Real-time Directional Signage

HOCHIKI EUROPE has announced its participation in what is described as a pioneering European Union-funded initiative to design an intelligent emergency signage system for the real-time direction of passengers during the evacuation of a transport terminal.

Called Project Getaway, it aims to improve passengers' ability to navigate transport terminals and escape to a place of safety, which often can be hindered by a lack of detailed knowledge of the internal connectivity of the building space or the most suitable means of escape.

Signage is acknowledged to be an essential aid to reducing the time spent searching for an escape route, however, it can be difficult to achieve, particularly in smoke-filled environments. Existing emergency signage is static and is not able to consider the evolving incident and how passengers should be routed accordingly. Research from the University of Greenwich, called Human Behaviour in Fire Network (HUBFIN), found that only 38 percent of people see static signage when they have to evacuate.

The long-term aim of Project Getaway is to enable transport terminal and interchange designers to trial new computer-based designs, modelling the efficiency of evacuation procedures with or without the new emergency signage system in place.

For more information, go to www.hochikieurope.com

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Report Challenges UK's Chief Fire Advisor

A report sponsored by the sprinkler industry through the BRITISH AUTOMATIC FIRE SPRINKLER ASSOCIATION concludes that it is both cost-effective and practical to retrofit automatic fire sprinklers in occupied, high-rise social housing blocks without disturbing residents.

The report was based on a pilot project where a comprehensive sprinkler system was retrofitted in a 1960s high-rise residential care home, with the residents remaining in their apartments. It disagrees with, and challenges the UK's Chief Fire & Rescue Adviser who in a 2011 report to the Department of Local Government and Communities said: "…it is not considered practical or economically viable to make a requirement for the retrospective fitting of fire suppression systems to all current high-rise residential buildings". The report was published in April.

For more information, go to www.bafsa.org.uk

Range Offers More Sound Options

APOLLO FIRE DETECTORS has added an open-area voice sounder and sounder beacon to its Discovery voice product range. Designed to provide clear instructional messages within a fire system, these latest enhancements offer six distinct messages and seven volume levels. Apollo says that the devices can be used in applications to ease confusion for the public, instructing them in a concise and intelligible manner on what emergency action should be taken in case of a fire.

Both products offer high volume and enhanced capability of up to 15 tone/message pairs, which reduces the risk of audible alarms being ignored. Both products operate only with the Discovery protocol.

For more information, go to www.apollo-fire.co.uk

Explosion-proof Manual Call Point

E2S, the manufacturer of warning devices for use in hazardous areas, has extended its capabilities with the development of the GNEx range of ATEX and IECEx approved Exe d explosion proof manual call points in GRP housings.

Designed for the manual activation of fire alarms, gas detection and emergency shutdown systems, the units are environmentally sealed to IP66. They meet the requirements for rugged, corrosion resistant non-metallic units for both onshore and offshore environments. Available as standard in a range of colours, including striped versions, different systems can be colour-coded to enable rapid visual identification in an emergency.

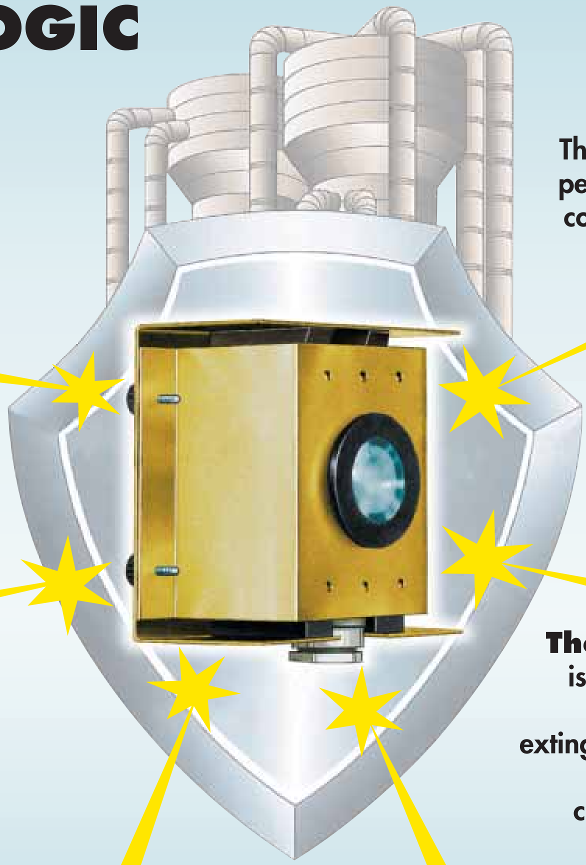
Available with break glass, push button and push button with tool reset operation, a comprehensive range of standard accessories such as a stainless steel lift flap, labelling options for stainless tags and duty labels is available. Series and EOL resistors in a range of different values can be fitted to all models as required and DPDT switching and LED indicators can also be specified.

The introduction of this new family complements the aluminium-bodied explosion proof and intrinsically safe call points, the BEx range of explosion proof sounders, beacons and loudspeakers, the E2x family of lightweight, corrosion-free PPS plastic and impact-resistant ABS units and the intrinsically safe IS-mini modular sounder and beacon offering.

For more information, go to www.e2s.com

CONTROL LOGIC Spark detector

designed for dust collection systems to protect storage silos from the risk of fire.



Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds

The CONTROL LOGIC SPARK DETECTOR is faster than the sparks themselves. It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash. It needs no periodic inspection.

The CONTROL LOGIC system is designed for "total supervision". It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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**IR FLAME DETECTOR
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ENCLOSURE**

For industrial applications indoors or outdoors where is a risk of explosion and where the explosionproof protection is required.
One detector can monitor a vast area and responds immediately to the fire, yet of small size.

**IR FLAME DETECTOR
RIV-601/F
WATERTIGHT
IP 65 ENCLOSURE**

For industrial applications indoors or outdoors where fire can spread out rapidly due to the presence of highly inflammable materials, and where vast premises need an optical detector with a great sensitivity and large field of view.

Also for
RS485 two-wire serial line

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Cable Safeguards City's New Museum

PRYSMIAN'S FP Plus enhanced-grade cables have been installed at Southampton's SeaCity Museum on the south coast of England.

SeaCity Museum celebrates the city's historical relationship with the sea and is expected to attract thousands of visitors every year. As a consequence, the fire safety systems are of paramount importance, and five kilometres of FP Plus cables have been used for the fire alarm system and disabled refuge alarms throughout the attraction.

FP Plus complies with fire alarm standard, BS 5839 enhanced grade and has received BASEC (British Approvals Service for Cables) and LPCB (Loss Prevention Certification board) approval. It incorporates Prysmian's Insudite, which reduces the risk of third party damage.

For more information, go to www.prysmian.com

Olympic Gold for Fire Detection Solution

A MORLEY-IAS BY HONEYWELL fire detection and alarm solution at the main halls of residence of the University of Hertfordshire's Hatfield campus will be operational in time to provide accommodation during the London Olympics this summer.

The new system includes 16 ZXSe fire panels, extending a Morley network that covers well over 25 buildings across the campus. The new systems are linked to smoke detection devices in more than 600 bedrooms at the Hatfield site, ensuring the University students benefit from the highest level of protection in the event of a fire-related incident. A Morley-IAS Visualeyez graphics workstation has also been installed to provide scalable support for staff managing the entire campus.

The solution should prove particularly valuable during the Olympics when a large number of different people will be using the hall for the first time. This will include temporary staff, typically working shifts and who may have limited expertise in managing fire safety systems. The Morley-IAS solution will ensure that they quickly become fully operational, providing maximum protection for everyone on-site and ensuring rapid and effective evacuation in the event of any fire-related incident.

For more information, go to www.morleyias.com

New Bells & Whistles

Several new bells, sounders and beacons designed particularly to suit any signalling need in a marine environment have been launched by APOLLO FIRE DETECTORS. The new offering spans from simple bells to separate or combined alarm sounders and flashing beacons, with a variety of input voltages and audio/visual output levels.

They include products for the marine market that include a marine version of the Roshni low profile (RoLP) sounder, the marine Flashni combined sounder beacon, the low-current electronic solenoid bell, the marine 150mm motorised bell 24V DC, marine Solista Maxi LED beacon, and the IP66-rated marine Asserta 110dB-120dB sounder and sounder beacon variants.

For more information, go to www.apollo-fire.co.uk

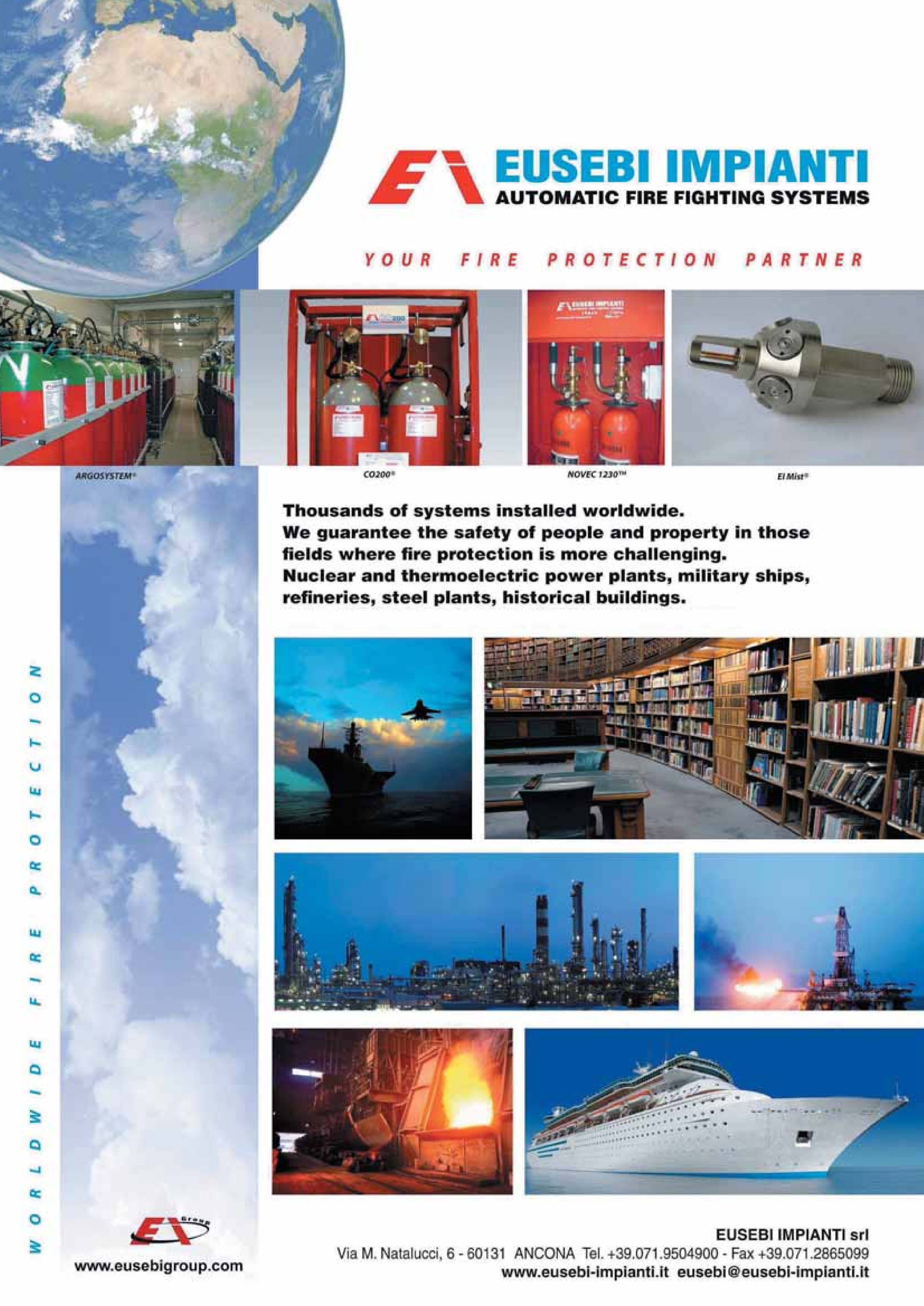
Emergency Assistance

Cooper Fulleon has launched Emergency Assist Alarm Kit, designed to allow a disabled person to call for assistance in an emergency from locations where they are likely to be alone, such as toilets, bedrooms, changing rooms and kitchens.

Simple two-wire connection is said to save time and installation costs, its durable housing makes it long lasting, and its dual-loop pull cord and blue high contrast labels aid awareness and visibility of the product. The use of a combined high-output blue LED indication and buzzer ensures a response to the call. Braille is incorporated onto the cancel button to assist the partially sighted.

The kit comprises all the components required to install a fully operational system: power supply, ceiling pull, cancel/reset button, over door indicator and an adhesive label to identify the accessible toilet door.

For more information, go to www.cooperfulleon.com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Tower of Moscow

The Eusebi Group, through its Russian joint venture, OOO Plamya E1, has won an order worth approximately US$ 6 million for the design, supply and installation of a water mist system, EI Mist, to protect the Ostankino TV tower in Moscow. This 540-meter high construction, which in August 2000 suffered a terrible fire, is the tallest in Europe and among the five tallest buildings in the world.

The Russian Ministry of Communications has placed its trust in the excellence-driven partnership of Eusebi's Group parent company, Eusebi Impianti S.r.l, which will be responsible for monitoring and dealing with the engineering of this complex project, and the Russian joint venture OOO Plamya E1, which will supervise the assembly operations, leveraging its ample expertise and widespread presence in the area.

The Eusebi Group was chosen from three potential players, who are widely regarded as the most important and technologically advanced in the fire protection field. The challenge lies not only on the design and technical sides, but also arises from the extremely tight deadline. Indeed, the Russian authorities seek the permanent and full protection of the tower by February next year.

The water mist system, EI MIST HP, complies with fire-prevention standards NFPA 750, IMO 913, A800, and IMO/CIR 1165. It has been tested according to FM (Appendix G and H) and certified by Bureau Veritas. The nozzles are tested to UL standards and tests were conducted on cabinets and electric cables with RINA Industry. Furthermore, this Class 1 water mist system (minimum diameter of the sprayed water droplets below 100 microns) is deemed appropriate to extinguish both Class A – solid fuels such as paper and wood – and Class B fires – liquid fuels like gasoline and oil – according to the above standards. IFP

For further information, go to www.eusebi-impianti.it or www.eusebigroup.com

XPander – Tried and Tested Radio Technology from Apollo

Fire detection systems in industrial and commercial applications have traditionally used hard-wired installations. These systems are generally installed at the time of construction or refurbishment, making the laying of cables less of an issue. However, certain applications do not lend themselves to this approach.

It can be very difficult, for example, to introduce cable runs into buildings that are not designed for the modern age. It may also be that a collection of buildings, such as an open air museum, requires fire protection, but is not suitable for normal wired systems. It is for buildings of this kind that Apollo Fire Detectors Ltd has developed its wireless XPander product.

Designed for use in areas where hard-wired fire detection is impossible or impractical, XPander devices provide an ideal solution in applications such as occupied buildings, listed buildings, heritage sites, castles and stately homes, annexes and temporary structures. All of these building types are likely to have strict rules regarding alteration to the original fabric of the structure, or would be negatively affected by the impact and inconvenience of re-wiring work or installing traditional fire systems. In these circumstances, channelling and wiring for traditional fire detection could cause damage to interiors, as well as disruption for building users during installation.

XPander devices can be found in The Royal Albert Hall in London, Marianske Lazne Theatre in the Czech Republic and The Guildhall in the UK city of Portsmouth, to name but a few.

Buildings that are undergoing fire system refurbishment can also benefit from wireless devices. In this instance, wireless fire detectors can be used to provide temporary cover until the old fire system is decommissioned and a new hard-wired fire system can be installed.

Wireless technology offers a number of benefits over traditional hard-wired systems: the installation process is greatly simplified; costs associated with potential damage to buildings are lower; the risk of business disruption is reduced and the technology is flexible, adaptable and cost-effective. What is more, the technology can provide protection to any building type, layout or structure.

Why XPander?

Apollo's XPander solution incorporates individual detectors, call points, interfaces and alarm devices in one system that communicates with the Apollo analogue addressable loop by radio signals.

The range includes an optical smoke detector, multi-sensor detector, heat detector, sounder and sounder beacon and a wireless manual call point. Site surveys will enable installers to determine the most appropriate system design and, with this in mind, Apollo has developed an XPander survey tool. Purchasing this tool equips the installer with the necessary equipment to carry out an accurate site survey.

Each XPander device is assigned an XP95 address and a loop-powered XPander interface controls up to 31 XPander devices. The XP95 address is recognised by the control panel in the same way as other XP95 devices connected directly to the loop wiring. Up to five XPander interfaces can be installed on each site and where more than five interfaces are required for each site, Apollo can advise on the most appropriate solution.

The XPander range benefits from the patented XPERT technology that is also used in Apollo's Discovery and XP95 ranges. The innovative product has been certified to a number of worldwide approvals including LPCB and CPD. Furthermore, the entire range is approved to EN54-25, which is the industry standard for radio equipment used in fire safety areas.

Key Features of XPander include:

- Made in the UK.
- Protected by Apollo's Product Lifetime Guarantee.
- Easy to install.
- XPERT card addressing.
- Proven technology.
- No special control panel needed.
- 868MHz radio signalling.
- Up to 31 devices for each interface.
- Up to five interfaces for each site.

Apollo offers a free one day training course on XPander, details of which can be found on the company's website. IFP

For further information, go to www.apollo-fire.co.uk/XPander or www.apollo-fire.co.uk/training

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* The detector is displayed with optional rain cover (sold separately)

Pic courtesy of Foster + Partners

John Mikkelsen

Crane Fire Systems Ltd President & General Manager

Spectrex Detection Protects The Bow

The BOW is a 158,000 square metre skyscraper office building in downtown Calgary, Alberta. The building is the tallest office tower in Canada outside Toronto. It is also considered to be the start of redevelopment of the city's Downtown East Village.

Crane Fire Systems' involvement with The BOW project started in 2007 and at that stage the decision to use HI-FOG Water mist had been made, but the detection method had not been decided. The use of HI-FOG water mist was predicated on providing a performance-based system that would not require the quantity of water a traditional deluge type sprinkler system would discharge. The hazard in the atrium areas is Class A in the form of trees, plants and shrubs, so the fire load is such that the amount of water required would demand large pipes that would be difficult, if not impossible, to conceal.

The new EnCana headquarters building, The BOW, is the first significant mixed-use development east of Centre Street in downtown Calgary. Providing an environmentally sustainable headquarters for one of Canada's leading corporations, the design creates a generous social space for Calgary, offering a new cultural, civic and shopping destination.

In recognition of water quantity and system cost, the decision was made to divide each atrium into two discharge zones with each zone covering 66 percent of the floor. This design provides an overlap of protection. The Atria, three of which have the shape of a quarter moon – narrow at the ends and deep in the middle – are each about 60 metres long, 2.5 metres wide at the tips and ten metres wide in the middle or the widest part. The main floor atrium is different in that it has a meandering second floor curtain wall in which the flame detectors and Hi-Fog nozzles are mounted. The width of the main floor atrium is the same as the others at the tips but in the middle it is a few meters wide. Ceiling height in each of the four atria is 12 metres, which equates to six stories in the building.

As Calgary is a winter city it is a requirement that new office buildings downtown be connected to other nearby office buildings by a pedestrian pathway called a +15 system. This would be the second storey in an office building. This allows

people to travel from building to building in a heated comfortable environment, without having to set foot outside. Great at minus 30°C weather. This feature affects The BOW as pedestrians can have easy access to the second floor level of the building overlooking the main floor atrium, without having to pass security.

Since discharge zoning was required it became necessary to find a detection method that was responsive, quick and programmable for area recognition. Air sampling systems and smoke detectors were not suitable candidates as smoke can drift throughout the protected space and detection would not necessarily correspond with the actual fire location. Naturally this could present a problem in a real fire situation.

Based on the fact that flames would likely appear fairly quickly in a fire situation it was decided to use a detector that could provide positive flame recognition and could actuate the water mist system covering the space in which the flame detector is located. This would be the most reliable detection.

At this point Crane Fire Systems approached Spectrex for their recommendation. They suggested the 20/20MI Triple IR detector because it is least subject to false alarms caused by sunlight and lightning and since one side of these atria is all windows, these features are important. Another benefit in using this detector is its small size and, with a total of 85 detectors installed in the four atria, they are hardly noticeable yet very much there when called upon to detect a flame.

The detection segment of the system has a main control panel on the 24th floor and a remote annunciator panel in the CACF control room on the main floor. Operation of any one Spectrex flame detector will cause an alarm condition on the main panel as well as the remote annunciator. The main building panel will receive the alarm signal from the panel on the 24th floor. Operation of a second detector within the same discharge zone as the first detector will cause the Hi-Fog system to discharge into that zone.

The only way to manually activate the Hi-Fog system is by key operated switches in the main control panel and remote annunciator, both located behind locked doors. This was requested by the Calgary Fire Department. The Hi-Fog systems are critical in protecting these atria as they are the primary defence; there are no sprinklers to provide backup protection so, based on the premise that an extinguishing system is only as good as the detection segment, the flame detectors are very important.

Triple IR (IR3) technology was introduced by Spectrex in the early1990s, providing revolutionary

long-range, highly sensitive flame detection with exceptionally improved false alarm immunity. IR3 detectors can detect a standard 0.1 square metre petrol fire at a distance of up to 65 metres under extreme weather and harsh industrial conditions, with an incomparable low false alarm rate. The region is monitored by three IR sensors, one of which is sensitive to infrared radiation emitted by the hot CO_2 product of fire (wavelength around 4.3 micron) and the other two reference sensors sensitive to background radiation (at longer and shorter wavelengths). These signals are further analysed mathematically with respect to their ratios and correlations.

To better distinguish between the signal (flame) and background (non-fire radiation sources that may exist in the monitored area), the most commonly used optical flame detectors employ two or more optical sensors coupled with specific filters sensitive to spectral bands that record simultaneously the relevant radiation at the selected wavelengths. The signals recorded by each sensor are analysed using special algorithms, designed with the goal of providing the best reliability possible with the selected spectral bands.

To better distinguish between the signal (flame) and background (non-fire radiation sources that may exist in the monitored area), the most commonly used optical flame detectors employ two or more optical sensors coupled with specific filters sensitive to spectral bands that record simultaneously the relevant radiation at the selected wavelengths.

The spectral bands selected for each type of detector, as well as the detection algorithm, affect the detector's sensitivity, detection range, speed of response, and immunity to false alarms. The main groups of optical flame detectors are defined according to the spectral bands that they use.

Industrial IR3 detectors are based on original IR3 detectors, but are made to be smaller and lighter at a lower cost, weight and power consumption. The industrial detectors have similar performance to the original IR3 series, allowing industries to cost effectively upgrade their expectations in numerous applications, such as the atria in The BOW building. IFP

For further information, go to www.spectrex.net

How to Minimise the Fire Risk to Structural Steel

Structural steel may be widely used in modern buildings, but it shares a key weak spot with any other construction method – vulnerability to fire. However, specifying the most effective method of protecting structural steel against that danger is not always a straightforward task. Sean Appleton of Promat UK explains.

The phrase structural steel conjures up images of a tough and utterly reliable building material that will surely keep a building standing, even in the face of overwhelming odds. This is perhaps one of the reasons for a widely held misconception that structural steel is somehow more immune to the effects of fire and so requires less protection against this ever-present danger than other construction materials.

Unfortunately there are many examples of the danger to modern buildings posed by fire, such as the recent blaze at the Federation Tower complex in Moscow. This broke out some 880 feet above street-level and took the authorities over three hours to bring under control. Another dramatic example is the major skyscraper fire which devastated the 32-storey Windsor Tower in Madrid, in 2005. This building was in the midst of a refurbishment programme aimed at upgrading its fire protection when a blaze started which later came to be referred to as 'The worst fire in Madrid's history'.

The upper storeys were completely gutted and the top six floors collapsed. Surprisingly though, the building did not collapse completely. Work completed prior to the blaze had included the installation of passive fire protection to the lower floors where it had not previously been fitted, and it was this that prevented a complete collapse. Pictures of the smoking building show clearly how the load-bearing steel columns that had been protected did not deform in the heat, unlike their unprotected counterparts. This graphically illustrates the necessity for effective and reliable fire protection for structural steel.

Passive fire protection that had been retrofitted to Madrid's Windsor tower saved the structural steelwork from collapsing

Boards such as Promat Vermiculux are easy to work with and can be cut to shape on site with normal hand tools

Protection Requirements

So what then are the requirements of this type of protection? It must clearly be able to resist being penetrated by fire, as well as preventing the transfer of heat and aiding the ability of the building to resist collapse. However, as most types of protection will perform well in these key areas, selecting the most appropriate one can often depend to a large degree on the length of fire resistance required, which can be up to 240 minutes for taller buildings.

Other factors such as means of escape, the nature of the building, the external appearance and the budget available will also exert an influence and help drive the specification to one of the three main types of passive fire protection – boards, spray-applied coatings and intumescent paints. Each has its advantages, each is better suited to some types of application than others, and all three can be combined to create an integrated and bespoke solution for each individual project.

Board Protection

Fire protection boards offer a very wide choice of variants and compositions to satisfy specific requirements. Certain board types, such as vermiculite or rock fibre, have the advantage of

Spray-applied protection can be used on more geometrically complex steelwork

being able to resist the effects of moisture. This enables them to dry out perfectly without losing any of their strength or performance characteristics. Exposure to water can even improve the board's fire resistance, and so they are ideal for use on steel frame buildings where they may be installed and then left exposed to the elements before the external cladding is added.

Boards are also easy to work and can usually be cut to shape on site with normal hand tools. Many feature a 'finished face' to which extra decoration can be applied once they've been installed. This often leads to boards being used to clad steel columns that already have intumescent or spray-coating applied, simply to improve the final appearance of columns so that they can be left visible and used as an interior design element within the completed building.

An Alternative Solution

As might be expected though, certain applications cannot be protected effectively with boards, with steel beams that feature web openings being a good example. These are becoming increasingly popular as they allow M & E services to be carried on the beam rather than underneath it. By minimising the headroom needed for each floor these beams can reduce the overall height of a multi-storey building and generate significant material cost savings. However they are not suited to cladding with boards and this is where cementitious spray-applied coatings may offer a better proposition.

Spray systems are typically based on either cement or gypsum, with a vermiculite or mineral wool insulant added to provide the fire protection. They can be applied easily to steel sections with a complex geometry, such as web openings in beams or complex junctions between beams and columns. Spray products such as those provided by Promat require a nominal cover of only 10mm to the inside of the web openings, which leaves plenty of space for services to be routed through the hole. Application costs are also usually less than either a board or intumescent coating, particularly when longer fire resistance periods are required. The spray application procedure also allows easier inspection of the finished installation to ensure that an even coating has been created that matches the thicknesses of the design specification.

A third approach to passive fire protection for structural steel involves the use of an intumescent coating. This type of system usually features a primer coat, a water- or solvent-based intumescent layer and a surface coat that protects the intumescent from any harmful environmental effects. When exposed to fire, the intumescent layer rapidly expands to as much as 50 times its original thickness, to create an effective insulating char layer that protects the steelwork. Suitable for off-site application, this type of thin-film system is usually less than 5 mm thick, which allows the steelwork to remain visible and be used as part of the building's interior design.

Many different factors can influence the choice of a board, spray-applied or intumescent system for a structural steel application, such as the specific details of the building's construction. For example, a composite design combining steel beams with concrete slabs is likely to have greater fire-resisting properties than some other construction methods and so might require a little less passive protection to achieve the required fire performance. The inclusion of active fire protection measures such as sprinklers can also allow the passive fire resistance measures to be reduced slightly, while the use of fire safety engineering methods to assess fire protection measures according to the specific level of risk involved may help produce a similar result.

There is a sizable raft of regulations, guidance documents, fire testing standards and codes of practice which can vary enormously from country to country, but which must always be adhered to. Perhaps the best course of action when it comes to finding a route through this confusing maze is to consult a passive fire protection product manufacturer. The potentially devastating consequences of specifying the wrong type of fire protection for structural steel means that this source of experience and reliable guidance should not be ignored. If that manufacturer can also provide a full portfolio of fire protection products then the route to a fully integrated and reliable system will be all the more direct.

Promat is the only manufacturer able to provide board, spray-applied and intumescent passive fire protection solutions which have been independently assessed and have third-party certification. It is therefore in a unique position to provide the best structural steel protection advice for your project. IFP

A thin-film intumescent coating usually features a primer coat, a water- or solvent-based intumescent layer and a protective surface coat

For further information, go to www.promat.co.uk

Fike Standard and Non-Standard Explosion Testing

In addition to standard explosion tests, Fike conducts customised explosion application and equipment tests designed for a customer's specific environment/application. Fike's unique testing capabilities and equipment include:

- Interconnected vessel and isolation test equipment.
- Accommodation of gas/vapour, dust, and hybrid fuels.
- Multi-channel high-speed data acquisition systems, instrumentation, and high-speed digital video available for capturing the physical characteristics of each event.
- Can accommodate USDEA Schedule 2, 3 and 4 controlled substances.
- Large scale testing available at state-of-the-art remote facility.
- Tests required by the U.S. Occupational Safety and Health Administration (OSHA).

In addition, Fike's explosion protection experts are available to assist in the development and completion of customer specific test plans.

For further information, go to www.fike.com

Dust and gas explosions are deadly and commercially devastating. Unfortunately, many of them occur at facilities without a prior explosion incident. Many facilities have inherent risks that must be addressed, requiring a complete assessment to determine what needs to be protected and the most effective means to accomplish safety goals.

The first step in the effective management of dust and gas explosion risks requires an understanding of critical explosion characteristics. Fike's combustion test laboratory provides explosibility tests in accordance with current ASTM, CEN and OSHA standards to assist companies in identifying and mitigating costly explosion hazards. Fike's test vessels are designed and constructed to provide accurate explosion protection data that is scalable to industrial equipment volumes.

In addition, Fike maintains a unique, 26,000 sq. ft. remote test facility for conducting large scale research, product development, and industrial application tests. Here, Fike has also developed some of the most advanced explosion mitigation solutions available today. Once characterised, Fike assists companies in determining prevention and protection objectives, followed by the selection and implementation of the appropriate explosion protection technology.

Venting

Explosion venting relieves pressure during an explosion by providing a planned pathway for the expanding gases to escape, preventing catastrophic damage to the process equipment. Venting is used when it is safe to release process materials and flames into the atmosphere/area. Care must be taken to vent only to safe areas to prevent injuries to personnel or secondary explosions from occurring.

Flameless Venting

When the vessel to be protected is located indoors, ducts can be used to safely convey the explosion to the outside. Flameless venting, in combination with Fike explosion vents, extinguishes the flame from the vented explosion without expensive ducting and limitations to equipment location.

Explosion Suppression

When the process materials cannot safely be released to the atmosphere, toxic materials are part of the process, or when it is impractical to use venting and flameless venting options, explosion suppression techniques are employed. Fike explosion suppression systems are designed to detect and chemically suppress an explosion in its earliest stages.

Explosion Isolation

Explosion isolation systems are designed to work in conjunction with both venting and suppression protection methods, by preventing the deflagration from reaching other areas through interconnected process pipes or ducts. Fike Explosion Isolation systems prevent the propagation of flame through the use of fast-acting valves and/or chemical barriers – effectively eliminating secondary explosions. These secondary explosions are often the cause of the most severe damage and loss of life. Fike Explosion Isolation systems prevent the propagation of flame through the use of fast-acting valves and/or chemical barriers – effectively eliminating secondary explosions. Regardless of other protection measures considered, explosions must be prevented from propagating to other locations within the facility.

Experience, technological expertise and large scale testing capabilities make Fike uniquely qualified to determine the appropriate protection for specific facilities. From testing and compliance expertise to the complete line of explosion protection solutions, Fike designs the correct, most cost-effective solution. IFP

Moving On Up!

C-Tec Relocates to Magnificent New Premises

Leading life-safety equipment manufacturer, C-TEC, has celebrated its 30th Anniversary by relocating to a magnificent new factory.

Situated at the heart of Wigan's Challenge Way commercial district, C-TEC's state-of-the-art facility measures an impressive 7,000 square metres (the size of three soccer pitches) and has been purposely equipped to set the stage for the next phase of the company's development. As one of the biggest employers in the area, C-TEC's expansion is certainly good news for the local economy.

The ground floor houses modern manufacturing, meeting, training and storage areas while the first floor is dedicated to office space. A custom-built glass staircase, clearly visible from the outside of the factory, links the two floors. A huge backlit C-TEC logo illuminates the spacious marble-tiled reception area and the external entrance to the building.

As one would expect, C-TEC's life-safety innovations feature prominently throughout the building. Two powerful 4-loop ZFP touch-screen controlled analogue addressable fire panels link to over 100 C-TEC-manufactured loop sounder beacons and Apollo devices distributed around the site. The panels present clear and constant feedback on all aspects of fire alarm activity via intuitive touch-screens. A Quantec addressable call system provides alarm facilities in the marble-tiled disabled persons' toilets and also functions as a panic attack/door monitoring system in certain areas of the building so staff can sound an alarm should they encounter an intruder.

A significant amount of space has been dedicated to training rooms. Over 500 engineers were trained on C-TEC products last year and the company is renowned in the industry for its hands-on free-of-charge courses.

Says Andy Green, C-TEC's Marketing Manager: "Our training sessions undoubtedly encourage customers to start installing our products and, as such, we have invested heavily in training facilities. The three new training rooms have been designed to facilitate many different types of product training to suit the various new product lines C-TEC will be introducing over the coming months."

Each room contains working demonstration boards of C-TEC's fire alarm control panels, call systems, power supplies and disabled refuge products. One-to-one training and product presentations are carried out in the meeting rooms adjacent to the training rooms. Two PDA200E induction loop amplifiers have been installed in each room to ensure that the sessions are accessible to the hard of hearing.

With regards to external security, a high-technology CCTV/speaker system has been installed to assist the security guards that patrol the building and its grounds. A series of C-TEC's EN54-compliant power supplies control the internal security doors.

Current Building Regulations insist that all non-domestic buildings with more than one storey provide 'refuge' areas, and a SigTEL disabled refuge/emergency voice communication system has been installed to enable two-way communication between rescue teams and disabled people waiting in the refuge areas should an emergency situation arise.

One of SigNET's Integrity Voice Alarm systems has been connected to the ZFP fire alarm system, and will broadcast alert messages in the event of an emergency. The system also connects to the telephone system to allow members of staff to page individual messages throughout the building from their telephones. In addition, Integrity stores a wide range of pre-recorded building-specific messages to help facilitate the smooth operation of the building. For example, staff in the collection area will be notified that a caller is waiting as soon as the button outside is pressed.

Says Andrew Foster, C-TEC's Managing Director: "Our magnificent new factory marks the beginning of a new era for C-TEC as we build on the successes of the last 30 years of manufacturing world-class life-safety equipment to venture into very exciting and previously uncharted territory. We intend to launch some highly innovative new product ranges that will dramatically enhance our status as one of the leading manufacturers of fire detection equipment. These are very exciting times indeed."

C-TEC's extensive range of fire alarm control panels, call systems, voice alarms and disability products, many of which are third-party approved, are currently protecting and improving the lives of thousands of people worldwide. The thriving business has been officially nominated as one of the UK's outstanding examples of manufacturing excellence in the Government's prestigious 'Made by Britain' initiative and its innovative Hush Button Fire Alarm Solution has also been hailed a remarkable success. IFP

For further information, go to www.c-tec.co.uk


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Moving Fire

Building on progress was the focal point at the UK's Fire Industry Association's (FIA) recent conference that called for the industry to drive progress forward through strong leadership and sector partnerships.

The theme at the FIA conference was *Moving Fire into Top Gear*. In keeping with which, FIA Chairman, Martin Harvey, touched on leadership through sector partnerships in his welcome note and CEO, Graham Ellicott, emphasised the point in his review of 2011's achievements and the Association's future plans.

Looking Forward

Graham Ellicott's plenary presentation entitled *Looking Back and Forwards* highlighted the importance of 2011 for the sector, which has had to adjust to significant changes in policy; legislation and fire standards; working together to manage pressures and opportunities in 2012.

He spoke of the FIA's focus over the past year on the on-going false alarms issue with an increasing number of UK fire services reviewing their policies for attendance at automatic fire alarms and the looming prospect of brigades considering charging for attending false alarms. The FIA has also been involved in a campaign to bring into line a number of fire authorities involved in trading. It is acceptable to engage in legal trading, he said, providing the organisation does not make a profit.

Tackling Unwanted Fire Signals

In Graham Ellicott's presentation, *The Changing Face of False Alarms*, he went into more detail on the issue of false alarms and explained how: 'they are a huge drain on public finances at a time when fire and rescue services are financially squeezed'. Between ten and 20 percent of systems cause about 80 to 90 percent of false alarms at an annual cost of over £1 billion. Besides the costs to businesses and the Fire and Rescue Service (FRS) resources, there is a risk to life from complacency caused by a high incidence of false alarms.

They are proving difficult to tackle as the Chief Fire Officers Association (CFOA) protocol to reduce unwanted fire signals has never been fully adopted and there is a wide variation of the response from the FRS to an unconfirmed fire alarm call. Some require confirmation before attending, whereas the response of others varies according to the time of day, type of building and whether or not the building is managed. Unsurprisingly, this 'postcode lottery' is causing confusion and risk and Graham called for more consistency among English brigades. Understandably, disparity in attendance policies among brigades and their empowerment to charge for false alarms are causing insurers' concern.

The FIA would like to work with insurers and others to ascertain the policy in different postcodes and the type of building. Charges to non-domestic properties have been identified, but the situation concerning blocks of apartments and

For further information, go to www.fia.uk.com

into Top Gear

domestic premises is potentially confusing. Communicating fire service policies has proved a bit of a problem – although they should all be in the public domain – only some are available via the Freedom of Information Act and those published online are not updated regularly.

Charging Challenge

Further to the issue of fire service attendance policies changes, Graham discussed that in February the UK government gave fire services the power to go to public consultation on whether to consider charging for attendance at automatic fire alarms. This would apply to non-domestic premises that are known 'persistent offenders', activated by proven malfunctioning or badly installed equipment. The idea being that this will encourage businesses to properly maintain their fire alarm systems and fire safety management, resulting in reduced time and money lost by fire services.

However, Graham highlighted the Association's concern that the alarm receiving centres (ARC's) in England may decide to disconnect fire systems and not pass on signals to the brigades if charged, which poses a potential disaster for fire/life safety. Also, it is not clear who will be responsible for paying the bill: the ARC or building owner? Graham added that it remains to be seen how enforceable charging would be and suggested that it will vary widely.

CFOA and the fire trade are looking at how charging might best operate. Graham suggested that any charge should be levied on the organisation employing the Responsible Person to encourage them to find a solution to the problem at their premises; and that there should be complete transparency with regard to what the charges relate. If it is not possible to charge the organisation, then the enforcement procedures under the Fire Safety Order should be invoked to make the Responsible Person rectify the problem.

The Association feels that that root of the problem lies in proper management of the fire alarm system; the FIA is involved in work on guidance for the Responsible Person, and leaflets have been produced on the 'changing face' of false alarms. Graham was able to describe a few examples of successful reduction and control of false alarms in the UK. But he also mentioned a good idea from the New Zealand fire service for upgrading systems and staff training through reinvesting fines into companies charged for troublesome systems. The vital role of competent design, installation and maintenance, and third-party certificated products and contractors, was also underlined.

Supporting Third-party Certification

The emphasis on third-party certification was driven by Phil Martin, FIA technical manager. He explained that the standards used for this are usually those produced by national or international bodies or reputable trade bodies, and provided some examples such as SP101/ST104 for extinguishers, LPS 1048 for sprinklers and ISO 9001 for quality management. There are also third-party certification schemes for fire risk assessors.

Phil dispelled common myths surrounding third-party certification, which include thoughts that it is merely a badge that does not eliminate poor quality and can make the product or service expensive. Phil explained that it helps a company to run better, brings more and better business and ensures fewer costly mistakes.

Phil advised ensuring that organisations are transparent through well-documented procedures – for example: the assessment of individual competence; registering and reviewing subcontractors; and producing a controlled document list and details of insurance.

Fire Detection and Alarm

Peter Mundy gave a much needed clarification of the relationship between BS 5839-1, EN 54-14 and ISO 7240-14. These documents all deal with the design, installation, commissioning and maintenance of fire detection and alarm systems but are aimed at UK, European or International markets. He reviewed the current status of BS 5839-1:2008: *Fire detection and fire alarm systems for buildings: Code of practice for system design, installation, commissioning and maintenance*, from several angles.

From a European viewpoint, he considered the potential impact on the standards, EN 54-14 and ISO 7240-14, particularly in relation to international and export projects. All three standards overlap in scope but differ in content, he explained.

BS 5839 was first published in 2003 and was reviewed in 2008 following the increased use in disabled refuge communication; the publication of BS 9999 and amended Building Regulations in 2010; and the introduction of new technologies such as, wireless-linked systems and audio-frequency induction loop systems. He reported that EN 54-14, the European fire alarm and detection system standard currently under development only provides a framework. If the draft EN 54-14 is published as an EN, it will have an effect on BS 5839-1 but is unlikely to replace it. At this stage it is believed that this will be a template document that will mainly be used by European countries that do not have strong national codes of practice.

Peter went on to consider the possible benefits of the recently published draft international detection and alarm standard, ISO 7240-14. This document is different to the others in that it provides only a prescriptive installation requirement similar to L1 in BS 5839-1. He described it as a concise and alternative standard that is: 'moving very fast' and is particularly useful for overseas territories that have no codes. The FIA is contributing to the development of these documents and will continue to represent the UK interests and keep industry informed of developments. IFP

All the presentations from the 2012 FIA conference are available on the Resources section of the FIA website at www.fia.uk.com

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- **Events Calendar** – A comprehensive list of fire related conferences and exhibitions. You can even upload your own event direct to the website.
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The Manual Call Point, the Human Fire Detection System

Mark Thomson

KAC Alarm Company

Even in the most sophisticated fire system installed in the most modern of premises, call points perform a vital role in enabling anyone to raise the alarm in the event of discovering a fire.

The activation of a fire detection system is achieved either automatically, initiated by a detector, or through a manual call point or pull station. Call points are used throughout Europe, Australasia and the Far East and pull stations are predominantly to be found in North America. Although the manual devices are very different in their design and operation, they are both the only Human Machine Interface (HMI) mechanism that an occupant of a building can use to activate the fire alarm system.

In certain circumstances, human intervention is going to be the fastest way of raising the alarm. For example, consider a boiler room, which typically will be protected by a thermal detector. If a slow smouldering fire was to develop, the thermal detector would take a very long time to respond, whereas someone entering the room will be able to react to the situation immediately.

The History

Long before the development of smoke detectors in 1941, the break-glass call point was the only means of activating the simple fire systems of the time. Today's intelligent automatic fire detection systems are complex arrangements of sophisticated detectors, high performance audible and visible warning devices and automated controllers for external systems such as air-conditioning systems, door controllers and other equipment, all managed

by advanced software. The functionality and performance of detectors and warning devices in the system has significantly improved as the result of technology advances, and while superficially the manual call point would appear to be unchanged, in fact, nothing could be further from the truth. It too has moved a long way forward from the original design, in which, when the glass was broken, a spring-loaded switch was released into the operating position, activating the warning bells. In those days, it was, quite literally, a question of breaking the glass using the hammer attached to the device.

Forty years ago, in 1972, KAC Alarm Company came into existence to manufacture a completely new design of break-glass call points, in which the idea of scoring the reverse of the glass and using a protective film enabling it to fracture cleanly and safely was first introduced. The fracturing of the glass allows a microswitch to activate the system.

This operating principle has been adopted as the *de facto* industry standard used by all manufacturers, and, together with the resettable version in which the operating element does not have to be replaced after use, is universally used in all installations.

Developments

Developments in call point technology have kept pace with the rest of the industry. In addition to conventional units, intelligent versions interface with the control panel through an embedded interface module, which, using the appropriate protocol for the system, enables the exact location of the device to be identified at the control panel.

Resettable versions, in which a plastic element drops down to enable the microswitch to operate when pushed, are a relatively recent development. In both types, replacement of the glass or resetting the plastic version requires a tool to be used by an authorised person. Pull stations operate somewhat differently; there are single-action units where the user pulls down a handle, and, more commonly, dual-action versions, where the user has to lift up and pull down or push in and pull down to activate the operating handle. Typically, pull stations feature a T-bar style pull, and, like call points, they have to be reset after operation by an authorised person using a tool.

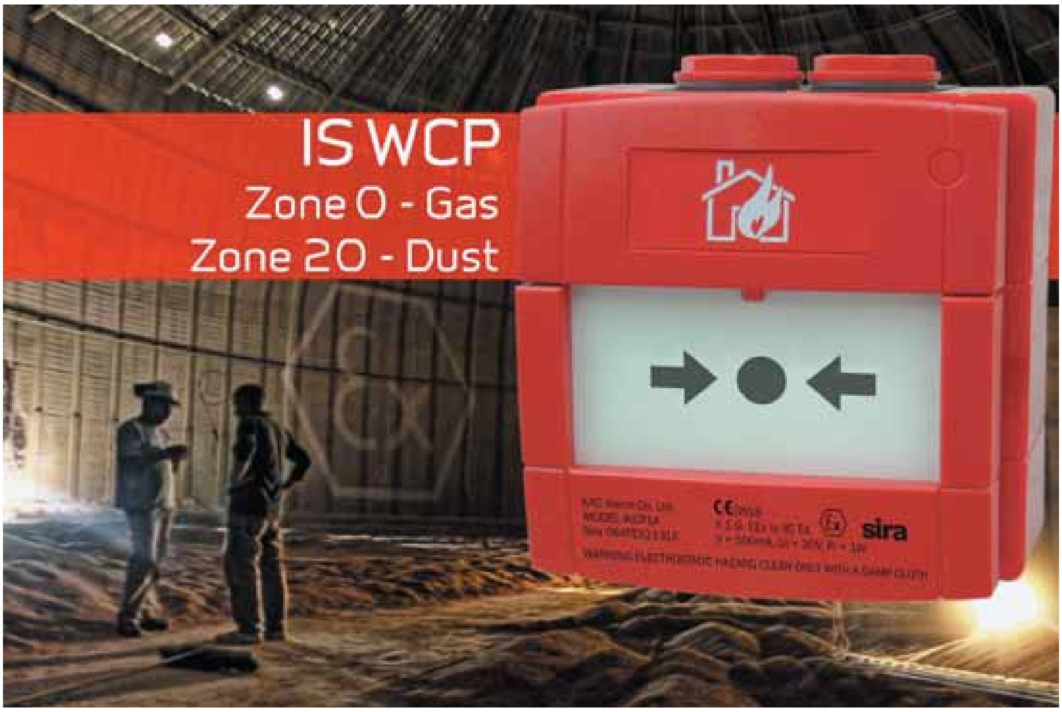
Resettable versions, in which a plastic element drops down to enable the microswitch to operate when pushed, are a relatively recent development.

In addition to break glass and resettable call points, other operating methods are widely used for specific applications. Key operated, push button and push button with protective cover units are all available from a number of manufacturers.

Specialist Applications

Arguably, the most important recent advances in call point design have been the development of environmentally sealed, explosion proof and intrinsically safe variants. IP66 or IP67 environmentally sealed units are housed in an enclosure that prevents water and dust from entering the call point. By providing devices that can be installed outside, in wet or dusty areas inside, or where equipment has to be hosed down for cleaning purposes, the fire system can be extended throughout the protected premises. In addition, good safety practice and legislation require an emergency stop mechanism to be installed on machine tools and other production equipment; waterproof call points are ideal for this requirement.

To install call points in hazardous areas, they must be either intrinsically safe or explosion proof. Hazardous areas are defined as areas where concentrations of flammable gases, vapours or dusts may occur, either constantly (Zones 0 and 20), under normal operating conditions (Zones 1 and 21) or infrequently (Zones 2 and 22). A whole series of additional conditions relating to the temperature classification and the auto-ignition temperatures of the type of gas or dust to be



found ensure that any installed equipment will not initiate an explosion or fire. Hazardous areas are to be found in a very wide range of manufacturing industries, far beyond the obvious petrochemical plants. Food, pharmaceutical and cosmetic manufacture all involve processing potentially explosive substances, while the problems of explosions in grain silos and sugar processing plants are very well documented.

The difference between the two types is that the input energy entering an intrinsically safe device is constrained so that any arcing or sparking

within the unit cannot generate enough heat to start ignition. In explosion-proof call points, the operating mechanism is mounted in an enclosure that is sufficiently robust to prevent any internal explosion from reaching the outside. While bulkier than intrinsically safe units, they are far more robust, enabling them to be installed in very demanding environments such as offshore oil platforms. Typically housed in a GRP or aluminium enclosure, they are environmentally sealed to IP66 or IP67 in order to achieve the explosion proof rating, enabling them to be installed in aggressive environments.

Other specialist options include call points that will switch up to 2A at 240VAC, enabling them to be used for replacements and extensions in the legacy mains voltage fire systems that are still quite common in many regions. While the operating methodology is the same, call point variants for particular applications are often colour coded for easy identification. The familiar red body is for fire systems; orange for smoke vent control, green for emergency door release, escalator emergency stop and similar uses, blue for security systems and yellow for extinguishing system activation or general evacuation signalling. To suit differing requirements, conventional call points are normally with single or double pole switches and a selection of different resistor values to suit the requirements of various control panel manufacturers.

Standards & Approvals

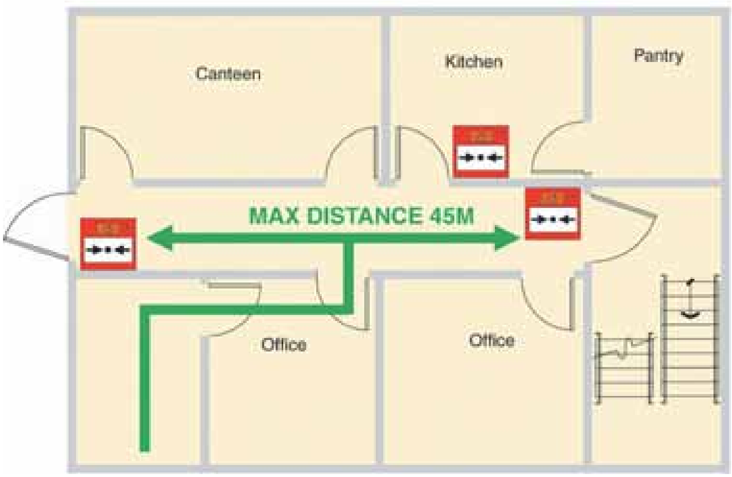
For fire systems, the relevant product standard for call points is EN54-11. Using approved devices is important in life safety systems; third-party testing by a reputable test house does far more than simply confirm the physical construction and operation of the device. Extensive tests for environmental factors such as operation at elevated temperatures, corrosion tests, EMC tests and shock and vibration are carried out, so a third-party test certificate gives the installer and user confidence that the device conforms in all respects to the requisite standard. Even if the installation code of practice does not make it mandatory to use approved devices, to use non-approved devices is a false economy that could potentially put life at risk if they do not operate when required.

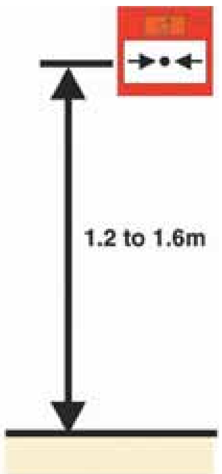
EN54-11 defines a pictogram of a house that must be used at the top of the body of a call point and two arrows indicating the optimum point on the operating element. In some markets, supplementary wording is often added to the house pictogram to remove any doubt about the function of the call point. For other specialised applications, a legend is normally printed on to the call point to identify the function and the body colour will not be the fire system red. The legend will normally be in the form of wording, for example, "Emergency Door Release", so the issue of different languages for specific markets immediately arises.

Call Point Siting

In buildings, call points must be installed at locations where they will be immediately obvious. The positioning of call points within premises is defined in the UK by BS5839 part 1:2002, the Code of Practice applicable to the installation of fire systems. All European countries have similar requirements, and although there are minor variations, there are generally few major points of difference. Manual call points should be mounted on all escape routes, and at all exit points from the floors of a building and to clear air, ensuring that occupants can leave the building quickly when necessary and activate the fire system while doing so.

It should not be possible to leave the floor of a building without passing a manual call point, nor should it be necessary to deviate from any escape route in order to operate a manual call point. Call





points mounted at the exits from a floor may be mounted within the accommodation or on the stairwell. In multiple storey buildings, where phased evacuation is to be used, call points should be mounted within the accommodation to avoid activation of call points on lower levels by people leaving the building.

In order to provide easy access, call points should be mounted between 1.2 metres and 1.6 metres from the floor, and should be clearly visible and identifiable. The maximum distance anyone should have to travel in order to activate a manual call point is 45 metres, unless the building is occupied by people having limited mobility, or a rapid fire development is likely, in which case the maximum travel distance should be reduced to 20 metres. Call points should also be sited in close proximity to specific potential hazards, for example boiler rooms or paint spray booths, where an environmentally sealed unit will be required.

Choosing a Supplier

When deciding on which call point manufacturer to use, specifiers should consider a number of points:

- Are the products third-party approved to the relevant specification?
- Does the manufacturer produce sufficient variants to cover the requirements of the installation?
- Is the manufacturer set up to produce relatively small quantities of devices in various body colours and with custom legends at an economical cost?
- Is there a learning curve for the installation team because the design varies from type to type, or is the wiring interface constant across all versions?
- How is the manufacturer perceived in terms of product quality, delivery performance, technical support and overall responsiveness?
- Are the conventional products available through reputable channels and can the intelligent ones operate under the main detector protocols: System Sensor, Apollo, Hochiki, Nittan and others?
- How easy or difficult is installation?
- Can the zone or loop wiring be tested for open and short circuits after the first fix installation, or does the actual call point have to be installed?

There will be other criteria based on previous experience, but if the answers to the majority of the above questions are positive, it should be a good indication that the supplier is reputable and its products can be relied on to perform to specification.

To conclude, call points perform a vital role in even the most sophisticated fire system installed in the most modern of premises, enabling anyone to raise the alarm in the event of discovering a fire. In smaller systems, they can be the only method of raising the alarm. Wherever they are installed, they provide a highly visible reassurance for the occupants and visitors to the building that a fire detection system is present. IFP

Mark Thomson is Head of Marketing at KAC Alarm Company

For further information, go to www.kac.co.uk

Pic courtesy of istockphoto

Impact of Sub-consultants in the Design Build Process

Scott Twele

Rolf Jensen & Associates

Integrated Project Delivery (IPD) is a common method used for design and construction in the built environment. IPD is defined as a collaborative alliance of people, systems, business structures and practices into a process that harnesses the talents and insights of all participants to optimise project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction. The most popular method of IPD is design-build.

Over the past 15 years, the use of design-build has greatly accelerated in the United States, making this delivery method one of the most significant trends in design and construction today. Design-build is a method of IPD in which one entity, the design-build team, works under a single contract with the project owner to provide design and construction services – one entity, one contract, one unified flow of work from initial concept through completion.

The design-build team consists of many players, including the general contractor, architect, engineering consultants, and a variety of subcontractors. Collectively, the team has the knowledge and expertise to complete a project from start to finish. Each team member is equally important in the outcome of the project. The role of the specialty sub-consultant is no different. The fire protection engineer (FPE) is a critical member of the design-build team. The role of the FPE is to provide comprehensive input and guidance on all aspects of fire and life safety for the project. This includes, but is not limited to, building code analysis, water supply, smoke control, fire department access, exiting, and an analysis of the active and passive fire protection systems.

From an FPE's perspective, the design build process can be broken down into four separate and distinct phases. Those phases are: the teaming phase; the pre-proposal phase; post-award phase; and the construction phase. Each phase is described in further detail below.

Pic courtesy of istockphoto

Teaming Phase

It is important for the client to understand the value of the FPE in the teaming phase, and communicating with the key individuals responsible for selecting the teams is a priority. Generally, the people responsible for selecting team members are the general contractor's project manager, project estimator, or the project architect. The value that the FPE can provide is not something that those responsible for selecting the teams may be familiar with, so it is important to reaffirm the FPE's role. Other disciplines can contribute to fire protection and life safety, but none of them take the total fire protection and life safety perspective that an FPE does. There may be a number of teams pursuing any design-build project. Establishing which teams to team with, and understanding the level of effort that is expected is critical. For example, the project could be an open bid available for many teams to compete, or it could be a multiple award construction contract, where a specific set of teams is shortlisted. The FPEs must balance their time commitment, as a short-listed project is more competitive and will take more of the FPE's time than the open bid type of project.

Depending on the size of the project, the general contractor may request an exclusivity agreement which binds the FPE or the FPE's company to that specific project team. One way to address this is to provide exclusive FPE support for the project as an individual representing your company rather than making the entire company exclusive. This allows for multiple FPEs within the same company to provide FPE consulting to multiple teams, if necessary. However, in order for this strategy to work, the project specific information for each team cannot be shared. Each project team will have a specific design that is proprietary and it is essential that the design-build team trusts that project strategies and specifics will not be given away to their competition.

Pre-Proposal Phase

The pre-proposal phase is the portion of the job where the design-build team has been established, and will collectively provide qualifications for a competitive bid or design to the building owner or agency for design and construction. There are several ways the FPE can support the general contractor or architect in the pre-proposal phase. The FPE can provide critical input to the request-for-proposal (RFP) analysis, request-for-information (RFI) development, and provide an analysis of site layout, construction type, water supply, and knowledge of specific engineering criteria.

The RFP is the nuts and bolts of the project. It contains all of the project specific information that the team needs in order to put together a package for the design and construction of that project. It is up to the FPE to thoroughly understand the fire protection requirements for that project and convey that information to the design-build team. Fire protection engineering is a discipline that spans many other disciplines, so cross-coordination among the various trades is critical. The RFP is not always clear in design intent and will sometimes require clarification from the building owner or agency. This is done in the form of a RFI. The RFI is a tool that allows for specific project questions to be asked so that the design-build team can better understand the project requirements. The role of the FPE in RFI development is to generate questions that help clarify areas within the fire protection requirements that may not be clear or may be contradictory. In some cases it may also be possible to offer design alternatives or value engineering to realise cost savings.

As stated earlier, the role of the FPE is to provide comprehensive input and guidance on all aspects of fire and life safety for the project. After the RFP is understood and RFIs have been clarified, it is up to the FPE to analyse the design-build package for compliance with specific engineering criteria, building codes, and National Fire Protection Association (NFPA) standards. As part of the team, the FPE should do his best to provide solutions that meet the code criteria yet also allow the team to fulfil its design vision.

The FPE should be analysing all disciplines for compliance with these requirements and cross-coordinating with the other trades. For example, the FPE can help provide solutions to construction type, height and area issues for a given occupancy type, and help coordinate fire resistive construction requirements with the team. The FPE can analyse the water supply for the site and determine if there is a requirement for fire pumps based on the flow test information provided in the RFP. Also, depending on the jurisdiction, the project may have specific engineering criteria that are specific to that jurisdiction. The FPE can help the team to understand those specific requirements and apply them to the project.

The effort from the FPE is critical in the pre-proposal phase. Through the analysis of the RFP and project specifics, the FPE can provide input that results in significant cost savings and reduced risk to the project team. Involving the FPE in the pre-proposal process allows for design clarifica-

tions and decisions to be made up front and the associated costs can then be built into the project price. On the other hand, if the FPE is not involved, design decisions can be made without knowledge or understanding of the fire protection requirements, and costs or project requirements can be missed. This is a detriment to the design-build team and could result in a design build package that does not include 100 percent of the required information and could ultimately result in that team not selected to win the job, or even worse, underbid the project.

Post-award Phase

The involvement of the FPE in the post-award project support is equally important. It is in this phase of the project that all of the strategies developed in the pre-proposal effort are translated into an actual design. It is important that the FPE stay involved throughout the entire design process to make sure the team is aware of any design issues that conflict with fire protection code criteria. The FPE should be active in attending design meetings, and in their review of the project design documents. This allows the design team to stay abreast of any issues and adjust their design accordingly.

Depending on the project requirements, the FPE may also be required to act as the designer-of-record (DOR) and sign and seal drawings. These drawings could include, but are not limited to, fire alarm, fire sprinkler, special hazards and smoke control design. As the DOR, the FPE is responsible for reviewing and certifying that the drawings are designed properly. The FPE is also responsible for providing oversight of the designing subcontractors throughout their design and coordinating among them and the other design disciplines. This is to ensure that the designs are properly integrated into the overall project design. By being actively involved in the design of the project, the FPE can provide design solutions that ultimately save time and money during the construction phase.

Construction Phase

In addition to the pre- and post-award services, the FPE also plays an important role in the construction phase. Not every project will require a FPE to provide construction services; however, all projects can benefit from the expertise of the FPE. The FPE is responsible for ensuring that all of the fire protection and life safety systems are installed correctly. This includes, but is not limited to, inspections of the underground water supply piping, fire-rated construction, smoke control systems, emergency lighting and exit signage, fire alarm, and fire suppression systems. During the construction process, installation errors can occur. The FPE can use his expertise to provide engineering judgments to determine the acceptability of alternative solutions if needed.

Typically, the FPE will interface with the construction quality control manager throughout the construction of the project. The FPE is responsible for being pro-active in identifying construction deficiencies so the contractor can make corrections quickly and effectively. The FPE should be diligent in maintaining constant communication with the quality control manager. This can be accomplished by developing up-front inspection checklists for the various systems so the contractor and his field personnel are aware of exactly what systems will need to be inspected and when. This can be further coordinated with the construction schedule so inspections can be optimised.

The value of the FPE in the construction process cannot be understated. In addition to the valuable input discussed above, the FPE acts as the buffer between the construction team and the authority-having-jurisdiction (AHJ). The deficiencies identified and solutions provided by the FPE throughout construction make for a much smoother project acceptance by the AHJ of the project. If an FPE is not involved throughout the construction process, the project could be constructed incorrectly, and could result in costly changes, or schedule delays.

Summary

The use of design-build has greatly accelerated in the United States, making this delivery method one of the most significant trends in design and construction today. The pace at which design-build projects move requires active involvement from the FPE throughout the teaming, pre-award, post-award and construction phases of the project. Although other disciplines can contribute to fire protection and life safety, none of them take the total fire protection and life safety perspective that an FPE does. The input that the FPE provides during these phases allows for the design-build team to make critical design and construction decisions that can maximise efficiency throughout all phases of design and construction as well as reduce design and construction costs. IFP

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For further information, go to www.rjainc.com

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Water Conservation

– the Future of Fire Sprinkler Systems

David L Asplund P.E.

The Reliable Automatic Sprinkler Company

Mankind has long been interested in what the future may hold in store for us. Whether one looks to the Ancient Greeks who consulted with The Oracle at Delphi or Doris Day who whimsically asks her mother, "Que Sera, Sera" (what will be, will be)? We as a species have a collective curiosity of what has yet to transpire.

During my 35 year tenure in the fire sprinkler industry, I have often been called upon to envisage the future. How many sprinklers will be required for this set of building blueprints? How many man-hours will be required to install the pipe on this project? When will the steel be erected or when will the concrete slab be cured? Recently, the most common of these requests to foretell has been to provide a financial forecast for use as a planning tool in developing a budget and/or business plan. This process, to say the least, remains a very vexing task for me. I love the absolute predictability of Newton's laws of motion (remember, gravity is not just a good idea, it is the law!) or the innate beauty of The Scientific Method to provide the repeatability of experiments in which the control group always give consistent and expected results. The dictionary provides the definition of the word *predict* as: foretell on the basis of observation, experience or scientific reason. Perhaps I have observed and experienced enough change and evolution in my career to apply some of my scientific reasoning skills and extrapolate some current trends that may come to fruition for our industry in the not too distant future?

The Population/Water Equation

Human beings and fire sprinklers are forever connected to water and as changes occur to our supply of clean, fresh and safe drinking water, humankind and fire sprinklers morph along with these changes. Earth is a water planet with more than two thirds of the surface area covered by water. Yet only about two percent of that water is considered to be clean, fresh, safe drinking water.

Water, also known as H_2O, is a unique and interesting molecule. One that is bi-polar, meaning it has a positively charged end and a negatively charged end. This creates covalent bonds between the individual water molecules and gives water a very unique set of physical properties (such as, it expands when frozen and creates service and repair revenue for fire sprinkler contractors during winter).

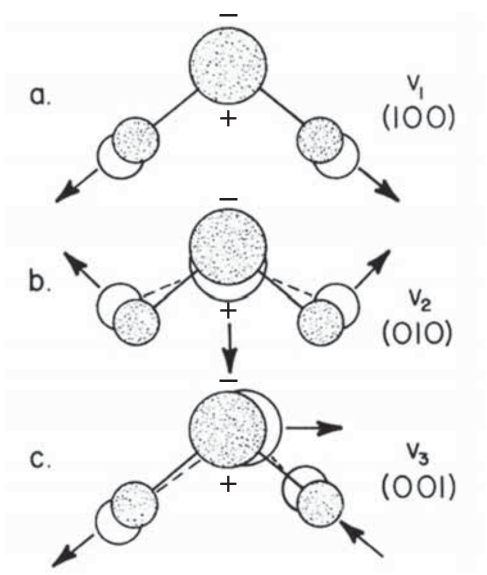
The human body comprises 93 percent water. Clean, fresh, safe drinking water is an important and invaluable commodity that is essential to our existence. Last autumn, a significant milestone

was passed when a baby was born that represented the seven billionth human being on our planet. Just over 100 years ago there were only two billion people on the planet. By the end of this decade we will exceed eight billion thirsty human inhabitants. Just like the law of gravity, microeconomics has a law, the law of supply and demand. Now let us think about that law as it relates to water. Is there more or less clean, fresh, safe drinking water today than there was 100 years ago? The answer to that question is no. Due to pollution, we have less clean, fresh, safe drinking water today than we did 100 years ago and soon we will have four-times more demand for it!

Green Building

In the past few years there has been a trend towards green building technology. Green building is a program to use sustainable, renewable and recycled building materials along with the intent to improve energy efficiency and water conservation in the construction industry. It is good to be green and I always feel like I am doing my part by recycling the various components of my trash, adjusting my thermostat and turning off the lights in empty rooms (I am still haunted by my father's voice bellowing, "electricity doesn't grow on trees you know?").

The fire sprinkler industry has been greatly affected by this green movement. Wastewater control is a paramount concern in green building.



So, is draining a wet fire sprinkler system across the parking lot and down the storm drain system in conformance with our new collective green consciousness? Many water purveyors are not letting fire sprinkler contractors drain black, smelly, mineral and bacteria fire sprinkler water into the storm water system. Storm water treatment facilities are just not set up to deal with all of the nasty stuff that is in used fire sprinkler water. The choices facing the sprinkler installers are few: drain the system down the sanitary sewer or drain the system into a holding tank and pump it back into the system. What will the cost of a simple tenant improvement project be under these rules? Please don't shoot me, I'm only the messenger.

Now is the time to apply some of our scientific methodology and analyse this trend to predict the future. How long will it be before these same water purveyors who enforce the "no fire sprinkler water down the storm drain" rule, begin to expand on it and say, "Hey, why should we let you fire sprinkler guys connect to our beautiful fluoridated, chlorinated, clean, fresh, safe drinking water supply and turn it into that nasty black smelly fire sprinkler water? Why don't you guys go green and use recycled, reclaimed and/or harvested rain water with your own tank and your own pump to supply the fire sprinkler system?" Hmmmmm, how long will it be? When our world population hits 1 ten billion or 20 billion?

Tomorrow's World

The demand to conserve water has spread to how current fire sprinkler research is being conducted. FM Global is the leader in applying real 21st century science to fire sprinkler technology. They have implemented much of this thinking with the publication of their new Data Sheets 2-0 & 8-9 in April 2010. Their intent has been to simplify and improve fire sprinkler protection for storage occupancies. To provide a better level of fire sprinkler performance while utilising less total water demand.

FM Global has a "future vision" of fire sprinkler technology that most likely will include a return to embracing intermediate level or in-rack sprinklers. Obstructions to the discharge of ceiling-only storage type fire sprinklers are a paramount concern. Obstructions that are thin as a wire can disrupt the downward thrust and momentum of a ceiling-only storage fire sprinkler discharge and cause lateral dispersal of the water spray. So much so, that the lateral movement of the water spray will land on adjacent sprinklers and cause them to be cooled to the point where they do not operate in a fire. This scenario is known as a sprinkler skip. Skips in ceiling-only storage sprinkler protection due to obstructions to the spray discharge are very detrimental to the performance of the fire sprinkler system and can lead to catastrophic failure of the sprinkler system resulting in over-heating the roof structure to the point of collapse.

The buildings of the future will be taller than ever before, exceeding by far the limitations of ceiling- only fire sprinkler protection. Property owners will want to maximise storage volume and minimise cost by stretching the walls skyward. Thus paying nearly the same for the foundation slab and roof systems, while adding cost for the extra height to the walls.

Storage buildings of the future will exceed 30 meters in height and will utilise the storage racks as part of the building structure to support the roof. Sophisticated computer-driven robotic pickers will, by far, outperform their human counter parts in filling and unloading the racks. Robots do not break in-rack sprinklers like their very human counterparts do, therefore eliminating the negativity towards the use of in-rack sprinklers.

Ceiling-only storage fire sprinkler protection schemes have much too high a water demand requirement for the future. Ceiling-only storage sprinklers can demand as much as 8,900 litres-a-minute and require a 60-minute storage capacity in excess of 535,000 litres of water storage. Future protection schemes that include ceiling sprinklers and in-rack sprinklers will have water demands in the neighbourhood of 2,500 litres-a-minute and 90-minute storage capacities in the range of 225,000 litres. If FM Global's true "Future Vision" comes to fruition, we may see water demands for storage fire sprinkler systems that include a water demand for either the ceiling sprinklers or for the in-racks. Not both. Fire sprinkler water demand could be as little as 1,300 litres-a-minute with stored water capacities as low as 118,000 litres.

I predict that the best years of the fire sprinkler industry lie ahead of us. Buildings will have more pipes and more fire sprinklers installed in them than ever before. Yes, more sprinklers and more pipes, but the pipes will be smaller in diameter to deliver the smaller overall water demands of these future fire sprinkler systems. More sprinklers and more levels of sprinklers will improve performance by lessening the distance from the sprinkler to the burning fuel surface and thus requiring less total water to extinguish the fire.

All fire sprinkler systems will be supplied by their own local fire pumps and water storage tanks and not be connected to the drinking water supplies. There is always risk when one tries to predict the future. Will my prestidigitations be accurate for the remainder of my career or life span? Will there be a singularity event where all of the robotic pickers of the world rise up to enslave the human race? Who knows? I just hope that on the morning of December 22, 2012 I am more correct in my predictions than the Mayans are in theirs. IFP

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For further information, go to www.reliablesprinkler.com

Taking Responsibi to Change

Fire safety is changing such that the performance of designs, products and systems is coming under closer scrutiny.

Mike Wood

Pilkington UK

There is a significant shift towards functional and performance-based fire safety design, with a greater emphasis on risk. That brings a sharper focus on quality and reliability of performance of designs, also implicitly of products and systems that essentially contribute to the delivery of design performance. Product risk profiles therefore become key considerations.

There is also an emphasis on personal responsibility for the provision of fire safety measures in buildings, backed up by fire safety law, not to be side stepped. Ways of working and nonchalant assumptions that may have served just adequately and unchallenged in the past may no longer be such a safe position to hold in a future of closer scrutiny, driven by greater sensitivities to the consequences of fire. Responsibility starts with the building owner and cascades along the manufacturing, supply and installation chain, including along the way those who also provide product approval.

There is good cause to sit up and take note.

Sources of Change

The modern urban environment is now evidently far more complex than it was only a few years ago. A short walk through any major city demonstrates that conclusion. Each building has its own individualistic features. There is a mix of architectural styles and ages. Many, in effect, have such large occupancies that they are effectively small towns in their own right.

The prevailing economic orthodoxy is that cities stimulate commercial activity and wealth, attracting more and more people to concentrate in one place. Buildings become larger, more complex, and crowded together on shrinking footprints; and, with space at such a premium, they stretch upwards in a variety of residential and commercial high-rises, frequently using eye-catching architecture to attract attention. Space utilisation and higher occupancy densities are at a premium. Buildings and their contents become highly valued, expensive assets.

Protection of Communities

Given such a variety in the built environment, there is much less scope for the guidance given in regulations for common building situations. There is less relevance for guidance originally based on traditional brick, stone and timber constructions, now superseded by modern methods and materials of construction. A more tailored fire safety approach is required, building by building.

More engineering-based design methods are sensibly coming in as a way of dealing with that complexity. Similarly, jobs and community well-being, both economic and social, depend on the protection of homes, employment and public facilities such as schools, universities, hospitals. A shift in the age profile also means that residential homes with vulnerable occupants are far more common than they were.

lity, Responding

Fire safety has therefore developed a wider dimension. Life safety remains the pre-eminent fire safety objective. That is repeatedly re-emphasised as emergency services find themselves under increasing pressures from squeezed public spending and more stretching demands.

There is an emphasis on increasing value in the built environment. The fire hazard is accordingly all the higher. Fire risks assume a higher profile, especially as insurers become more uncomfortable with rising property losses. In addition, margins for error are contracting as buildings are built and refurbished under increasingly tight constraints, moving closer to the edge where vulnerability to fire becomes more critical.

Fire Knowledge

Fire safety science and technology is now advancing quite strongly. With that introduction of new methods and new thinking comes more questioning of materials and structures in fire. The trend is towards a more informed and scientific design process, using a more risk-based approach. Evidence comes from the stream of work now flowing through the international standards process. Risk-based methods introduce searching questions of products and systems; a different set of questions than asked by the traditional prescriptive approach (essentially founded on handed down, accumulated received wisdom).

These methods are concerned with what could happen in practice should fire break out, grow and spread. It employs a structured process starting from a profile of the building itself, its type of occupancy function and required layout in the context of the varied objectives that apply. It is an integrated design process, and therefore fits well with an integrated concept of fire safety. Under a process that looks more closely at performance in real fires, products that are subjected to only superficial and limited testing, which may perhaps be close to the edge, with evident failings, are likely to be found out.

Testing

The spotlight created under a risk-based approach to fire safety is increasingly turning to key questions of likely performance in practice. Are the products fit for purpose in real "natural" fires? Where are the limits of product performance? How does the product perform under varied fire conditions? What is the expected fire scenario, and what sort of product do we want? These should be key questions for responsible suppliers.

The roots of the standard fire resistance test stretch to the early 20th century. The test regime and temperature-time profile has not changed that much since then. It is a formalised test, carried out to represent a particular post-flashover condition, based essentially on a largely cellulosic fire load. Its prime purpose is to allow basic product classification under a convention that defines fire resistance in terms of two main performance categories, either integrity (that is, a physical barrier to flame and fume) or insulation (meaning. a heat barrier, defined by measured surface temperatures) together with a specified test time (30, 60, 90, 120 and 180-minutes).

Common mistakes are to refer to "fire rated" materials without specifying exactly what that means, also an assumption that time in a fire test directly correlates with survival time in a real fire. It does not. A single fire test only gives evidence of a product's tendency on the day of that particular test, for the assembly and conditions used on that day. It does not significantly provide information that can be handled in quantitative design.

Implications of Risk

Testing should not be used mechanically to rubber stamp a product through the approval process. But too often that can be the case. Failure in testing means that the product is not good enough. The number of failures, and degree, are not even required to be recorded.

In fires, a fatal flaw that causes failure could lead to catastrophic consequences. Real, so-called "natural," fires have significantly different temperature-time profiles than the standard test profile. And because of the potential for sudden temperature increases from the burning of modern, high fire load, synthetic furnishings, fittings and components, there is a particular risk to glass fire barriers. Glass is notoriously susceptible to thermal stress and shock. Some types, for example the modified toughened category, are more susceptible than others and need much more care and attention.

In particular, the traditional way products are

tested for fire resistance in significant respects does not provide the type of information required under a risk-based engineered approach. Key information for the designer, specifier and engineer, looking at degrees of risk, is to understand the weak points and probability of failure, together with exactly what the failure is likely to be.

Product Risk Profile

How can a product risk profile be put together and evaluated? A much more detailed evaluation of test evidence needs to be carried out than is currently the case. Greater attention needs to be given to failures (and frequency of failure). The mode and mechanism of deterioration is a key consideration.

There is a massive difference between gradual, progressive and more controllable failure, or catastrophic and disastrous failure that occurs without warning. But that information is not available from standard test reports. Good performance is not just attaining a certain level of performance on one occasion, or only sporadically. What matters is consistent performance time after time after time (on random representative samples).

Consistency and reproducibility are therefore key inputs to a risk-based evaluation to take out a major potential element of uncertainty. And product failure is arguably more pregnant with useful information than somewhat sterile pass reports.

Manufacturer's Advice

The best choice is to talk to the manufacturer and judge their openness, integrity and honesty in explaining how their products work and level of success /failure they achieve. The total weight of all test evidence should be examined. That includes the number, range and scope of tests, in particular the different types of applications and framed systems that are covered.

Where the tests have been carried out – for example, in how many different test centres – and the test standards used also provides useful information. There is, for example, a significant difference between superseded national test procedures using a point thermocouple for furnace control and those tests using a plate control couple (experience has shown that the BS EN condition is more arduous than BS 476-22, by as much as 15 percent).

System Thinking

Fire resistant glass is a good illustration of a core principle that should apply to all fire protection products. Glass is used within a fire-resistant glazed system, and it is the system as an integrated set of components that has to function reliably. A weakness in the system can cause the whole system to fail. For a fire-resistant glass it is the glass together with the frame (design and material), the sealants, the beads and bead fixings, glass location within the frame, and the fixings of the frame to the surrounding structure that has to work effectively together.

There are particular risks in making generic, or global, assumptions. In particular what is achieved with one fire-resistant glass may not be achievable with another. Tested approvals are individual approvals and apply to particular configurations, glazing pane sizes, aspect ratios, framing systems and extent of glazed area. Testing, for example, as a single pane does not mean that the glass is likely to function equally as effectively when installed in more extensive glazing assemblies, which may include a range of sizes, with transoms and mullions that can affect performance.

Robust Technologies and Products

The extent and range of test evidence will also vary from one glass to another. Decisions based on superficial comparisons are not advisable. Different manufacturers also may well have different attitudes to quality, use different types of technology and apply different control processes. It is not possible to identify two fire-resistant glass products that are exactly alike and completely interchangeable. Even products nominally within the same technology group can in practice show different levels of consistency and reliability of performance. Each glass should be treated individually on the merits of its own applicable test evidence. The validity of assessments made on the basis of presumption and extrapolation, rather than within the field of available test evidence, should be evaluated closely.

What is needed, given the uncertainties of fire, is a robust product based on a robust technology – that is, a product able to respond effectively and consistently to potentially varied fire conditions while delivering the same performance promise. Special conditions apply to some types of fire-resistant glazing more than others to avoid a compromised performance. For example, special care and attention needs to be taken with modified toughened soda-lime-silica fire-resistant glass types. Others, such as wired glass and intumescent fire-resistant glass laminates, are generally more robust, being more tolerant of glazing layout, framing variations and fire conditions.

Confronting Complacency

Fire is inherently unpredictable, with tremendous capacity to surprise. Because of potentially fatal and costly consequences there can be no room for complacency, or for irresponsible short cuts or failure to address known weaknesses. All suppliers, specifiers and installers should keep in mind the advice that, no matter how successful a design might appear to be, there is always the danger that latent failure is lurking beneath the surface. That guidance should be the stimulus for a constant drive towards consistent, quality performance from products and systems. IFP

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Construction Prod
Changing the Face

Clifton Gare-Mogg

Apollo Fire Detectors

The Construction Products Directive (CPD) is set to be replaced by the Construction Products Regulation (CPR) in July 2013. What are the implications, and what steps need to be taken to ensure compliance?

The Construction Products Directive (Council Directive 89/106/EEC) (CPD) was initially introduced by the European Union (EU) in 1988. As a 'Directive', countries had to implement the Directive in local legislation. In doing so, the UK, Sweden, Ireland and Portugal chose to interpret the Directive differently to others in the EU.

In the UK, it was implemented through Statutory Instrument 1991 #1620 & Amendment SI 1994 #3051. This difference meant that any construction products manufactured in these countries were not required to carry the CE mark. Another unfortunate outcome of this was that some within the industry interpreted it to mean that they were not required to meet other requirements of the Directive. The UK Government claims that this was not its intention. The CE Mark – an acronym for the French 'Conformité Européene' – denotes that a product has met the health, safety and environmental requirements of the EU. It is effectively a technical 'passport' for cross border trade, enabling manufacturers to market and sell their products across the EU and European Free Trade Association (EFTA) countries.

With the UK implementation of the CPD, manufacturers selling their products exclusively within the UK market did not require the CE mark. However, if they were selling products into a country that had adopted the CPD, all of their products would have been required to carry it.

Initial changes to this approach began in 2011 when the CPD was replaced by Construction Products Regulation (CPR). Part of the EU change to use a Regulation rather than a Directive is that Regulations are legislation implemented directly from the EU and may not be implemented through local legislation. The EU wished to avoid a repeat of the misunderstandings experienced with the implementation of the CPD. The CPR was formally published in the Official Journal of the European Union on 4 April 2011 with the first parts of the Regulation coming into force shortly after publication. The greatest impact of this new

ucts Regulation – of Compliance

legislation will be felt from 1st July 2013, when the main provisions of the CPD come into force.

The CPR states that all products that are within scope of a mandated European Norm (EN) have to be CE marked. A differentiating feature of the CPD and CPR is that to show conformity a product must be tested and approved by and independent third-party, a Notified Body. Other Directives, such as the Electromagnetic Compatibility Directive (EMC) or Low Voltage Directive (LVD), allow self-certification to show compliance. The CPR, which will be led by the Sustainable Buildings Division of the Department for Communities and Local Government (DCLG), will be achieved by providing a 'common technical language', offering uniform assessment methods of the performance of construction products. In effect, this move means that CE marking will become mandatory in every EU member country for all products that are to be placed on the EU market within the scope of harmonised European Standards (hENs). For products not covered, or not fully covered, by a hEN, CE marking may be applied through a European Technical Assessment (ETA).

certification of conformity can be lengthy. For complex products or situations where there are several products within a range, testing can take up to several months as every product has to be individually tested. Similarly, if problems or issues are identified during the testing process, this can lead to the testing process taking longer than anticipated or products having to be retested. It is worth noting, however, that products that met the original requirements of the CPD will be classed as CPR compliant unless the standards for that product have changed or additional requirements have been set within the CPR.

So, what steps do fire manufacturers need to take to apply for the CE mark and ensure compliance?

Firstly, they need to produce a Declaration of Performance (DoP). The DoP gives the manufacturer the opportunity to deliver the information about the essential characteristics of the product they want to deliver to the market. The manufacturer is required to draw up a DoP when a product covered by a harmonised standard (hEN) or a European Technical Assessment (ETA) is placed on

The introduction of the CPR is set to change the face of compliance for manufacturers. Companies face a significant commercial threat. If they do not have the CE mark on all required products, they will not be able to sell them within the EU, including the UK, after July 2013.

Within the CPR, certain products, including life and safety critical products, will have to be third-party tested by a Notified Body, which I will come back to later. The new legislation will apply to both domestic and commercial fire products including:

- Fire Detection Products to the EN 54 series of standards, excluding EN 54-13 Compatibility.
- Domestic Fire Alarms to EN 14604.
- Fixed Fire Fighting Systems – components for gas extinguishing systems to the EN 12094 series of standards.
- Fixed Fire Fighting Systems – components for sprinkler and water spray systems to the EN 12259 series of standards.
- Fixed Fire Fighting Systems – hose systems – hose reels and lay-flat hoses to EN 671 Parts 1 and 2.

Timing is Everything

Although the main provision of the CPR will not become law until July 2013, it is vital that fire product manufacturers act now – if they have not already – to ensure that all of their products are tested and certified to use the CE mark by this time.

Understandably, the testing process to achieve

the market. By drawing up a DoP, the manufacturer assumes the responsibility for the conformity of the product with the declared performance. It is important to note that by using the CE mark, manufacturers are stating that their product meets *every* requirement of *all* of the regulations that apply to that product. Most products that must comply with the CPR must also comply with other EU directives and in this situation, the manufacturer will have to draw up similar declarations for each applicable directive.

To produce a DoP within the CPR, manufacturers will need to select an approved Notified Body via their Schedule of Accreditation. Notified Bodies are appointed by the United Kingdom Accreditation Service (UKAS). The manufacturer will then have to obtain a European Commission certificate of conformity covering the constancy of performance, which is issued by the Notified Body. The CE marking used on the product will then have to include the body's number on the information. It is vital that manufacturers ensure that their appointed Notified Body is able to test to the standard without exclusion. The message for manufacturers is that they need to read the small print, look out for the word 'exclusion' and, where there are

exclusions, determine how these are addressed. In some cases, the Notified Body may have to outsource some of the testing to other bodies, due to limited resources.

Resistance to Change

The introduction of the CPR is set to change the face of compliance for manufacturers, however, as with any significant change of this magnitude, there are some companies within the fire industry that are reluctant to invest the time and money to have all of their products tested. By sitting on their laurels, these companies face a significant commercial threat: if they do not have the CE mark on all required products, they will not be able to sell them within the EU, including the UK, after July 2013.

As well as the time considerations highlighted above, there is also the issue of the level of resource required to undertake the third-party testing. There are a limited number of Notified Bodies capable of testing fire industry products and they only have set resource capacity, so it is important that UK manufacturers do not leave it until the weeks running up to the July 2013 deadline to have their products tested.

Manufacturers must also consider the cost implications associated with testing; independent third-party certification can be a costly exercise. To thoroughly test a smoke detector could take weeks and may cost in the region of £50,000.

The commercial reality is that manufacturers will have to comply with the CPR or risk losing business.

Wider Benefits

End users of fire protection equipment will benefit from unified rules across the EU, which will improve free trade and competition. Users will now be confident that CE marked products – approved to the CPR with an appropriate DoP – will meet the tough performance and quality requirements of the mandated standards and will have been independently third-party tested and approved. This should remove concerns that some products on the market are sold under descriptions such as 'designed to meet...' or 'tested to...', which are unsubstantiated statements made to support sales of products. A fire detection system that is not properly certified could also leave the user open to prosecution.

It is also important to consider the implications of the CPR's introduction on the wider public. These are life-saving products but are often given little consideration by the general public, who take it for granted that they will be well-protected in the event of a fire. However, manufacturers whose products meet the CPR can be assured that their products have been properly tested. For example, at present, if a UK holidaymaker takes his family on a trip to France, they are in theory better protected because fire products have been tested to the highest level. However, if the same family had gone to a small hotel in Brighton, they could, until now, only have been reassured that the owner would have been legally obliged to meet the installation code BS 5839, demonstrating that the right products were in place, but would not have been required to have CE certified products. Surprisingly, holiday makers in the UK may not have been *guaranteed* that the same quality of products was used in fire alarm systems.

The Future

Due to the implementation of the CPD in the UK, independent third-party product testing and approval has not been adopted by all manufacturers. When the CPR is introduced, it will not be independently policed, but it is likely that local regulatory bodies, such as insurance bodies or local fire services, might pick on any non-compliance issues. The introduction of such a sizeable piece of legislation is understandably going to be a long, drawn-out process, particularly for those manufacturers that have not yet taken steps to gain certification for their products.

Recognising that the CPR would be introduced, some more forward-thinking manufacturers are already quite far on in the process of gaining certification for their products. At Apollo, for example, we have had all of our products tested over the past ten years and are now fully prepared for the July 2013 deadline.

There are also cases of reputable, small manufacturers who are finding the CPR requirements to be counter-intuitive or acting as a barrier. In this situation, the manufacturers may actually be operating at a higher level than the standard requires, which can delay or add confusion to the testing process. The message for these manufacturers is not to lose heart – there are many good fire products out there in the market that have not been tested yet. The testing process can seem arduous, but it is worth it in the long term.

Conclusion

The message for manufacturers is do not bury your head in the sand. With the July deadline just around the corner, time really is ticking for manufacturers who should be well along in the process of getting all of their products tested. Apollo has invested a lot of time and money in ensuring that our products are fully certified, as it is important for us to have our products peer reviewed and to have the confidence that they have been third-party tested and approved.

For anyone looking to source fire products, the message is simple – ensure that every product specified is properly certified (CE marked) and that if a product has different modes, that all of these modes are also certified. For example, a heat detector can have a number of different settings but within CPR, every mode needs to be certified. It is also important to be wary of, or even avoid, products that use phrases such as 'designed to meet' and 'complies with...'. The key word to look out for is 'certification'.

Ultimately, the industry should view the introduction of CPR as an opportunity rather than a threat – it will help to protect and save lives and it gives end users another level of confidence in fire products. IFP

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Structural Fire Engineering & Optimisation of Fire Protection

Allan Jowsey

International Paint

Structural fire engineering can bring many advantages to a project including reduced fire resistance ratings and optimised fire protection requirements. Understanding its application together with characteristics of a passive fire protection material can bring cost savings to a project, while maintaining a safe and robust structural design.

Structural codes and guidance documents around the world cover the design of steel structures in fire. Those who use these codes have the opportunity to exploit the properties of structural steel to its maximum capacity in the fire limit state. When used effectively there can be significant benefits to the project, including robust and safe designs, quantified structural performance and cost savings.

The suitability of a member in a structural design is generally governed by serviceability limitations such as deflection. Generally this approach provides a conservative working stress for the steel sections of approximately 50 percent of their overall capacity. Within the UK, this simplified approach led to the development of generic limiting steel temperatures of 550°C for columns and 620°C for beams.

Best-practice industry guidance advises designers to specify a limiting steel temperature together with the fire resistance period as part of the overall steelwork specification. In reality, passive fire protection is generally specified post design-stage at a contractor or applicator level and sometimes very little is known about the limiting steel temperature.

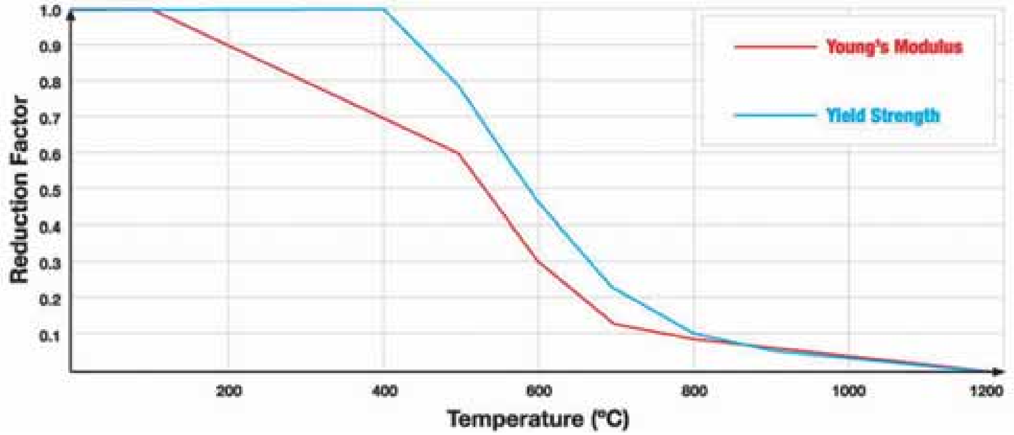
Steel as a Construction Material

Steel is used across many iconic buildings around the globe as the basis of the structural frame or to define certain features. Passive fire protection to steelwork is a very important safety element of any building. If not correctly specified it could have severe consequences in the event of a fire.

An increased understanding of how the performance of steel structures behave at elevated temperatures can provide safer solutions by understanding the steel failure temperature that is required for a given fire scenario by means of a structural assessment.

Steel at Elevated Temperatures

Structural steel starts to lose its yield strength at temperatures around 400°C and at 600°C at



which point, approximately 50 percent of its yield strength will be lost. In order to maintain stability, it is critical to ensure that structural members are fully protected against the high temperatures that are often generated in fires.

There is an increasing paradigm shift in the way of thinking by passive fire protection suppliers towards recognition of structural fire design approaches. Many structural engineers and fabricators are starting to collaborate closely with manufacturers in terms of product performance knowledge.

Many structural design codes and guidance documents include 'fire resistant' design. In the UK the relevant standard is BS 5950 Part 8:2003 and in Europe the relevant codes are EN 1993-1-2:2005 for steel and EN 1994-1-2:2005 for composite steel and concrete design. In BS 5950-8 and the Eurocodes methods are given for determining the thermal and mechanical response of the structure and evaluating the fire protection required, if any, to achieve the specified performance. An important feature of the standards is that they use the concept of a variable steel temperature, that is, the limiting steel temperature before the critical failure temperature is reached.

Defining a Fire Resistance Rating

Typically an architect would stipulate the fire resistance period in accordance with the building codes or regulations that prevail in the country or region where the building is to be constructed. There are a number of international fire safety codes and guidance documents currently in use, including the National Fire Protection Association (NFPA) suite of documents and the International Building Code and BS 9999.

These documents typically indicate a period of fire resistance for the building, which is generally determined based upon the height of the building, the occupancy use and the potential provision of a suppression system. The duration of a fire resistance period can be anywhere up to four hours depending on the associated risk.

In general, the standards do not specifically call for fire protection of individual structural elements, but they do stipulate that the building should remain stable for the fire resistance period. The stability of the structure acts primarily to protect life safety in terms of people to evacuate safely and for attending firefighters.

To realise the many benefits of the structural steel frame and to help maintain stability in the event of fire, it is often necessary to provide passive fire protection to some, or all, of the individual members that make up the steel frame. Unprotected steel can perform poorly in fully developed post-flashover compartment fires, which can lead to full or partial collapse.

Strictly speaking, a fire resistance period is only part of the fire resistance rating for structural steelwork. The performance criteria of a structural member should be defined not only by its fire resistance period, but also by its maximum allowable temperature at that period to maintain stability, termed the limiting steel temperature.

Typically to allow for the correct specification of the fire protection, the following minimum information is required:

- Fire test standard *e.g. EN 13381-8.*
- Fire resistance period *e.g. 90 minutes.*
- Structural section *e.g. I-column.*
- Degree of exposure *e.g. 4-sided.*
- Limiting steel temperature *e.g. 684°C.*

Load Ratio & Limiting Steel Temperatures

The limiting temperature method may be used to assess the structural stability in fire of members including columns and beams. The limiting temperature, which should not be exceeded during the required fire resistance period, is dependent upon a number of factors:

- The ratio of the load carried during the fire to the load capacity at ambient.
- The temperature gradient within the member.
- The dimensions of the section.
- The yield strength of the steel.

At ambient, structural design uses the concept of ultimate and serviceability limit states. Associated partial safety factors to represent these states are applied to the given loads acting on the structure. The resultant loads are used in a structural assessment to generate steel member sizes. At the fire limit state however, the partial safety factors may be different to those for ambient.

The resulting load in the fire limit state is effectively reduced to account for the probability that in the event of a fire the structure is unlikely to be loaded to its capacity and can be justified using statistical evidence of actual measured imposed floor loading. The ratio of the effective load applied on the member in the event of a fire to the load at ambient is termed the 'load ratio'.

Both BS 5950-8 and the Eurocodes use the concept of load ratio as a measure of the applied

load that a member can resist at the time of a fire. In practical designs, the load ratio may vary from 0.45 to 0.55. However it is not uncommon for designs to have a load ratio greater than or less than these values. For a given load ratio, the maximum permitted temperature is termed the limiting temperature. In essence, the steel member will function satisfactorily at the limiting temperature but will fail at higher temperatures.

Lookup tables are defined in BS 5950-8 and EN 1993-1-2 to define the limiting steel temperature for a range of different member types for a range of load ratios.

Industry Temperatures

In the absence of an appraisal of a member's limiting temperature, the UK passive fire protection industry has adopted limiting temperatures as follows:

- 550°C for typical columns in compression.
- 620°C for non-composite beams supporting concrete slabs or composite slabs.
- 520°C for hollow sections.

Industry prescriptive temperatures vary across the world in accordance with relevant legislation. For example, UL 263/ASTM E-119 uses a maximum limiting steel temperature of 538°C for columns and 593°C for beams; in parts of Europe, the temperature is commonly 500°C and in China the concept of limiting steel temperature does not exist – this is in place of a single protection thickness to cover all steelwork. In the offshore industry, Classification Societies typically set a limiting steel temperature of 400°C.

The Steel Construction Institute (SCI) in the UK has acknowledged that the temperatures of 550°C and 620°C are acceptable for most circumstances but not always.

In the case of cellular beams, then the above generic temperatures are not applicable due to the fact these beams have additional failure mechanisms as a result of their openings which need to be accounted for. As such, there are no generic temperatures for these beams and their limiting steel temperature must be determined based on a thermal and structural assessment.

Performance-based Design Approach

There are number of approaches available to designer's to establish a limiting steel temperature. These can range from an assessment of the load ratio and simple lookup temperature, to single element checks through to whole frame assessments including advanced finite element methods to account for restrained thermal expansion and load paths within the structure. Often, the greater the level of complexity and interaction consideration, the greater the potential to increase the limiting temperature and make reductions in the passive fire protection costs.

The appraisal of the limiting temperature for structural elements is an exercise that is best carried out once the structural design has been finalised as the section sizes may still be subject to modification at various stages throughout the design, including at a steelwork fabricator level.

A common method of assessment is to assess the degree of utilisation of a structural member in the fire limit state through a single element analysis. This approach considers beams or columns in isolation with conservative boundary support conditions and effectively reproduces the load-bearing scenario of a standard fire test as close as possible by calculation.

Manufacturers of passive fire protection subject their products to a fire test package that comprises unloaded and loaded beams and columns at minimum and maximum product thicknesses. In the UK and Europe, the result of this test package is a dataset that defines the required protection thickness for structural sections over a range of limiting steel temperatures, typically 350°C to 700°C in 50°C intervals. Certified product listings available in the public domain, typically only show the thickness of material required to satisfy the accepted industry standard temperatures. Manufacturers may not typically publish their product-specific multi-temperature assessment (MTA) thicknesses. It is therefore in the interest of engineers concerned with defining limiting steel temperatures for the purpose of setting steelwork specifications to coordinate closely with passive fire protection suppliers to ensure that the potential benefits are understood.

Summary

The use of structural fire engineering techniques to calculate a structural member's limiting steel temperature can result in savings of the required volume for fire protection material for a given project. In the intumescent coating industry this can have further benefits by reducing the dry film thickness required on each member which in turn requires fewer coating applications. This can bring significant time savings to construction schedules and labour costs.

While the use of generic limiting steel temperatures in the absence of a structural assessment may in the majority of cases be conservative, this may lead to an over-application of passive fire protection. It is also acknowledged that in some cases they may not always be conservative, leading to an under-application of fire protection.

Given that the methodologies exist in the design codes to undertake a structural assessment to determine the limiting temperature, qualified engineers within the contract chain should be encouraged to evaluate steel temperatures and to work closely with passive fire protection manufactures to realise the benefits it can bring. Rather than assuming performance criteria, setting steelwork specifications for fire protection in this way can assist to inform robust design based on quantified structural assessment. IFP

Dr Allan Jowsey is Fire Engineering Manager for International Paint

For further information, go to www.international-pc.com or www.akzonobel.com/international

Technology and St
Emergency Lightin

Emergency and escape route illumination must make it easy to use the nearest and shortest designated exit paths

Bernard Pratley

Industry Committee for Emergency Lighting

Fire safety legislation demands that commercial, public and industrial buildings must be safe at all times, so virtually all of them will need emergency lighting schemes that are fit for purpose in protecting them and their occupants if an emergency occurs.

If an emergency occurs in a non-domestic building, particularly fire, it is absolutely crucial to make it as easy as possible for people inside to make their way out quickly, without panic, through designated escape routes. This is especially critical in a building fire as most people who are unfamiliar with a building tend to try to leave the building the same way they came in, usually ignoring shorter escape routes. Therefore, emergency lighting and escape route illumination must make it as easy as possible for those evacuating buildings to see clearly how to safely and quickly make their way out to a place of safety.

Most emergency lighting systems were produced using fluorescent lamps for emergency lighting; many still do. Today, however, building managers have real choice, especially when considering the latest technologies – automated testing and the use of LEDs in emergency luminaires and exit signs. These can bring significant safety, energy saving, time and cost benefits.

Risk Assessment

Ideally, before undertaking the design of an emergency lighting scheme, lighting designers should be given a copy of the premises' risk assessment carried out by a competent person on behalf of the owner/occupier. This document should clearly identify any anticipated risks from activities planned to take place in the premises. This enables the emergency lighting designer to propose the most effective system to protect the occupants of the premises.

Accurate dimensioned premises plans should clearly show the layout of points of specific risk, such as staircases, lifts, changes of level and any firefighting or first aid equipment. Moveable partition walls can be a cause of concern for scheme designers if the specified lighting levels, or emergency evacuation routes, are adversely affected. Care must be taken to ensure that exit route signs are suitable and fully visible at all times.

Extra emergency lighting provision may have to

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be made in the UK to ensure that the premises concerned meet the requirements of the Disabilities Discrimination Act (DDA), and allow for the safe shutdown of any equipment installed.

Emergency Lighting Regulations

In England and wales, the Building Regulations require that systems comply with BS 5266-1, the Code of Practice for emergency lighting. The latest 2011 edition provides guidance on the method of assessing the requirements for emergency lighting to high risk areas, with special recommendations for such as kitchens, plant rooms and first aid rooms. ICEL, the emergency lighting arm of the Lighting Industry Association (LIA), publishes its 1006 document. This should also be consulted to establish the risks that may be encountered in many premises; included is a model risk assessment plan.

European standard EN 1838 (the minimum emergency lighting design requirements for workplace applications) should also be consulted. Compliance with this will help ensure that the minimum emergency lighting levels within the building concerned are met, and that all emergency luminaires and exit signs are correctly placed and fully compliant.

To ensure that the emergency luminaires and exit signs themselves also comply, products from ICEL-registered companies, or companies that have had their products third-party tested and approved to EN 60598 2 22, should be considered. This will help ensure that the performance and life expectancy of the emergency lighting scheme is maintained.

It is essential that, for the safety of buildings and their occupants, all relevant emergency lighting regulations, and the standards that support them, be complied with. There are no short cuts to successfully providing cost-effective and well-designed emergency lighting, which will provide lighting of a suitable quality and quantity if a mains power failure or other emergency evacuation situation occurs. It will also bring peace of mind to all involved that the scheme concerned is fit for purpose in protecting the building and its occupants. Non-compliant emergency lighting systems may not do this, and if anything goes wrong, designers, building owners, facilities managers and responsible persons may find themselves being prosecuted for non-compliance.

Therefore, initial scheme design, as well as regular risk assessments carried out in the premises concerned, are even more crucial today than they used to be. All involved are responsible if the emergency lighting installation is not fit for purpose. The same is true if poor maintenance causes the emergency lighting luminaires to provide lower lighting levels than those required for the safety of building occupants. Be safe, not sorry – ensure that emergency lighting is compliant and fit for purpose.

Automatic Testing for Peace of Mind

In the UK, the Regulatory Reform (Fire Safety) Order 2005 makes the 'Responsible Person' responsible for fire safety, which includes emergency lighting and escape route illumination . The emergency lighting Code of Practice BS 5266: Part 1, and Fire Safety legislation under Section 7 (testing, maintenance and record keeping), requires that 'Responsible Persons' test their emergency lighting systems regularly and record the results. Such manual testing can be lengthy, expensive and disruptive, especially in large buildings, and can be difficult to achieve while keeping the building concerned legal and fully working.

Unfortunately, some building owners, facilities managers and employers may be unaware of the periodic testing and maintenance requirements laid down in BS 5266. This, when combined with other risks such as time pressures on employees, can lead to manual emergency lighting checking not always being fully carried out. If legal requirements are not fully complied with, prosecutions can result and building occupants may be put at risk.

The latest Automatic Test Systems (ATS) address this issue by regularly checking, without human intervention, that emergency lighting batteries, lamps and luminaires are working correctly. ATS also provides early notification of failure or performance degradation. Test results still have to be recorded, but this can be automated. The result is peace of mind for those tasked with ensuring that their emergency lighting system is fully working and fit for purpose.

There are two main types of ATS under BS EN 62034:

1 A self-test emergency luminaire performs tests and indicates the results.

2 A test system performs tests automatically on one or more emergency luminaires, with a remote panel providing results.

ICEL recommends considering installing an ATS conforming to BS EN 62034. Although ATS has a higher initial cost outlay, the payback period can be quite short when set against the cost of subsequent manual testing.

People not familiar with a building tend to leave it the same way they entered

Emergency Lighting Lamps

Essentially, there are two main types of lamp technology used in emergency lighting systems – fluorescent and LED.

Fluorescent Lamps

Over many years, manufacturers of fluorescent lamps, long the mainstay of emergency lighting, have continuously developed ever more efficient lamps to reduce energy requirements while also minimising the amount of mercury inside. These developments have been very effective, but reducing mercury in a fluorescent lamp may adversely affect emergency lighting operation if the emergency lighting control gear is not designed for such low mercury lamps – as might be the case with a lamp replacement.

For example, the lamp may not strike, or if it does start, the slower increase in light output at switch-on may not meet the 5 second to 50 percent and 60 second to 100 percent output required by the product safety standard BS EN 60598-2-22. Insufficient power could result in insufficient light output, and too low a lamp heat could shift the colour temperature to appear pink. The emergency period of operation may be reduced because of higher circuit watts demanded by the lamp. Moreover, emergency lighting lamps may have shorter service lives than mains lighting equivalents. So emergency lighting is generally more demanding of lamps than mains operation and care must be taken to ensure compatibility of the lamp with the control gear.

Even so, the fluorescent lamp is an excellent solution for most emergency lighting applications, as long as emergency lighting luminaires are re-lamped in accordance with information supplied with the luminaire.

Good quality fluorescent lamps provide the following benefits:

- Fluorescent lamps are very efficient and usually need to be dimmed in emergency lighting mode – saving energy.
- High efficiency optical designs coupled with the greater flux enable wider spacing of luminaires.
- When the luminaires are correctly spaced, compliance with BS 5266 applications standards can be met with minimum power consumption.
- They have a proven performance record and are economic.

LED Lamps

White light LEDs are now suitable for most emergency lighting luminaires. They can bring many benefits:

- A well-directed bright, uniform light.
- Compared with equivalent fluorescents, good LED emergency luminaires and exit signs often save 30 percent energy because of their better-directed light output.
- LEDs are virtually unbreakable and have a very long life.
- LEDs are unaffected by extremely low temperatures.
- Exceptionally modern, unobtrusive and innovative LED emergency lighting luminaires can be designed – even integrated into building structures, which would be impossible with conventional lighting.

T5 miniature fluorescent emergency lighting lamps have a relatively limited lamp life, so need to be replaced on a regular basis, which is costly and disruptive. LEDs' longer life can substantially reduce such maintenance costs and office disruption.

Correctly installed emergency lighting luminaires should easily achieve the required 1 lux at the floor, using just two 1W LEDs, plus LED control gear (driver), inverter and a three-hour non-maintained 3.6V battery.

Benchmarking Emergency Lighting

Benchmarking aims to bring confidence in emergency lighting. The 'Responsible Person' has to risk assess premises by checking fire safety equipment. He or she must identify any upgrades required, and must also either obtain third-party assurance for fire safety equipment (including emergency lighting), or must demonstrate – possibly in a court of law – that the fire safety equipment is of 'suitable quality'.

As a leading emergency lighting technical authority, ICEL provides such independent third-party benchmarking (registration). Where an ICEL member company supplies an emergency lighting luminaire for benchmarking, it means that upon successful completion of the BS EN 60598-2-22 tests, the submitted emergency luminaire, its manufacturer and the manufacturer's performance claims have been independently approved. It can then be demonstrated to inspecting fire authorities that the equipment is of the required quality. So, though benchmarking is not a legal requirement, it helps provide peace of mind. IFP

Bernard Pratley is Director of the Industry Committee for Emergency Lighting

For further information, go to www.icel.co.uk

Raising the Standard

Firestop sleeve

Markus Schneider

Hilti

A new European Technical Approval (ETA) for fire-stopping systems for penetration seals around pipes and cables will lead to greater safety.

A new European Technical Approval (ETA) for fire-stopping systems for penetration seals around pipes and cables, and construction joints within fire-rated walls and floors means that such products can now be provided with a CE mark and placed on the market within European Union member states. The new ETA offers a reliable and clear definition of the field of application of products, which will lead to higher levels of safety throughout Europe.

The ETA is based on European-wide agreed written field of application rules and introduces more demanding European Standards including: EN 1366-3 for evaluating the fire resistance of penetration seals; EN 1366-4 for evaluating fire rated construction joints; and EN 1364-4 for perimeter seals of curtain walls. This standard also defines the maximum movement for which a joint is designed to be tested, in combination with the fire test. The new ETA describes a clear field of application for each product.

These demanding requirements will offer additional safety and reliability for the installed products, resulting not only in greater trust in the products and their applications, but also increasing confidence in fire-stopping suppliers.

Why Change?

Fire and smoke spread represent a significant risk to lives and can result in enormous damage to buildings. Compartmentation and correctly installed fire-stopping of these compartments play an important role in reducing the spread of fire and smoke and improving the smoke tightness of buildings.

The European test standards and the new European Technical Approval will increase the level of safety of buildings. Under the new system, a supplier has to provide a Certificate of Conformity (CoC) issued by an independent body that has audited the factory production control system. This will ensure improved consistency and reliability of fire-stopping products, particularly in cross-border construction projects. It will also simplify the approval of building projects and improve the acceptance and enforcement of fire-stopping systems by construction authorities and insurance companies.

However, it must be noted that it is important to compare like with like. A simple comparison of two CE-marked products is not sufficient. A detailed examination of the actual approval (ETA) for the approved field of application, including additional attributes tested (such as acoustics) is of key importance. This will, of course require decision makers to have an additional level of knowledge and competence. The ETA will show exactly the applications for which a fire-stopping product is covered, and under what circumstances the product can be used.

The new ETA will enable fire-stopping suppliers that actively care about the safety of occupants and the reduction of overall fire and smoke risk in a building to demonstrate a clear differentiation between their products and those of their less scrupulous competitors. Some companies may

# of Penetration Seals

aggressively price their products and offer just a simple small-scale application test, without clearly communicating the limitations of applicability associated with such an approach.

Improper use of small-scale test data may endanger the whole approach of the new European Technical Approval Guideline, so it is important that these issues are clearly understood by all those responsible, such as building owners, risk engineers, specifiers and architects and installers including mechanical or electrical or specialist fire-stopping contractors. The field of application of a fire-stopping product and its suitability for this application must form an integral part of the calculation of the cost-benefit-safety relationship for the passive fire protection of any building.

Testing of Penetration Seals

The new European standards introduce more stringent controls of what and how to test than many of the member states' national testing standards, which only consider the basic conditions for how to operate a furnace. For example, in the UK, BS 476-20: *Fire tests on building materials and structures* describes the "Method for determination of the fire resistance of construction (general principles)". It states that the test results can be used for assessments, adding that an assessment is an "opinion of a laboratory or expert". A certificate based on a BS test is therefore not comparable to an ETA-based on EN testing and written rules for the field of application for resistance to fire that in addition requires other characteristics, for example, reaction to fire, and factory production control by a third party.

Testing of penetration seals and linear joint seals according to EN 1366-3/EN 1366-4 and of perimeter joints of curtain walls according to EN 1364-3 (full scale test) or EN 1364-4 (part configuration) introduce:

- More severe test conditions (for example, furnace pressure).
- Strict field of application rules related to the use of standard configuration.
- Differentiation between open/ventilated and closed pipe systems.
- Clear differentiation of pipe materials, pipe dimensions and pipe insulations.
- For movement joints, consideration of movement capability in the fire test. The EN classification contains detailed information on the performance of the product. It includes the fire resistance class, the orientation of the linear joint, its movement capability, width and splice options.

ETA & CE Marking

The legal basis for ETAs and CE marking in Europe is the Construction Product Directive (CPD). The Construction Product Directive defines six essential requirements for buildings:

- Mechanical resistance and stability.
- Safety in case of fire.
- Hygiene, health and the environment.

Firestop sleeve installation

- Safety in use.
- Protection against noise.
- Energy economy and heat retention.

The last five essential requirements are related to fire-stopping products and so should lead to an increase of the awareness of these issues for all specifiers and building owners. They are an integral part of the approval system and are now tested according to clearly defined standards. These additional attributes deliver an added value and also provide a higher standard regarding safety and building performance.

In many countries, there are already clearly defined legal requirements in connection with acoustics ratings, environmentally relevant product properties or additional specific requirements for different building types, such as hospitals or hotels. Such requirements may include water, smoke and gas tightness or explosion/blast resistance. Movement capability of fire rated construction joints can now be approved based on the European Standard tests, which also simulate the behaviour of a movement joint in case of fire. Besides a reliable testing scheme and the resulting approval it is also very important that it is simple to install products correctly and that the installation is easy to inspect.

Improving building performance with innovative fire-stopping products also increases the well-being of employees, tenants and building owners during the life of a building.

From 1 July 2013, the CPD will be replaced by the Construction Product Regulation (CPR). This will make CE marking mandatory for products covered by a harmonised European Standard (hEN).

CE marking for products not covered or not fully covered by a harmonised European Standard will be voluntary and available via the European Technical Assessment (ETA) route. Currently, fire-stopping products for penetrations seals and linear joint seals are not covered by a harmonised European Standard and will be CE marked on the

Example for the Description of the Field of Application for a Cable Penetration Seal System with an ETA

The following is an excerpt from a technical data sheet for a pre-installed fire-stopping product for cable penetrations. It shows the description of the application field covered by the related European Technical approval.

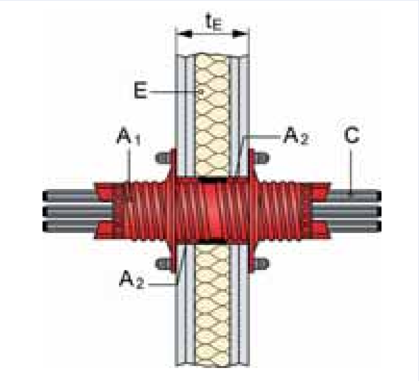
Cable penetration

Flexible walls/Rigid walls

The intended use of the Hilti Firestop Sleeve CFS-SL is to reinstate the fire resistance performance of:

Flexible walls/drywall (E), minimum thickness 100 mm (t_E) and maximum thickness of 200 mm with timber or steel studs lined on both faces with boards of an overall thickness of minimum 25mm. For timber stud walls, there must be a minimum distance of 100mm between the seal and any stud, and the cavity must be filled with a minimum of 100mm insulation of Class A1 or A2 insulation in accordance with EN 13501-1.

Rigid walls (E) concrete, aerated concrete or masonry, minimum density of 650 kg/m^3, minimum thickness 100mm and a maximum thickness of 200mm (t_E).



Firestop foam installation

Penetration seal (A)/ services (C)	Wall type (E) and thickness (t_E)	Classification E = integrity I = insulation	Other criteria Description
All sheathed cable types[1)] ≤ diameter 21 mm	Flexible Wall Rigid Wall ≥ 100 mm to ≤ 200 mm	EI 120 (CFS-SL M)	The gap around the sleeve to be sealed with Hilti Firestop Acrylic Sealant CFS-S ACR on both sides of the wall (A2)
All sheathed cable types[1)] ≤ diameter 50 mm		EI 90 (CFS-SL M)	
All sheathed cable types[1)] ≤ diameter 80 mm		EI 60 (CFS-SL M)	
Tied cable bundle, maximum diameter of 86 mm, maximum diameter of single cables 21 mm		EI 90 (CFS-SL M)	
Blank Seal[2)] (no services penetrating)		EI 120 (CFS-SL M)	

[1)] All sheathed cable types currently and commonly used in building practice in Europe (for example power, control, signal, telecommunication, data, optical fibre cables).
[2)] For further details see ETA.

Note: This example shows a product system for cable penetrations only. The description of fire-stopping systems for more complex applications, for example, mixed penetrations, will be much more extensive.

basis of an ETA in the future.

The European Technical Approval Guideline for Penetration Seals and Linear Joint Seals (ETAG 026-2/ETAG 026-3) includes clear tasks for manufacturers. It is not sufficient to sell a CE-marked product with just an ETA. Suppliers are also required to give a detailed description of how to install the product (instruction for use) and make available a technical data sheet for the installer. Among other things, the technical data sheet must contain all relevant data from the ETA regarding the detailed field of application.

The visible manifestation of compliance of a product with an ETA for the customer is the CE mark, which is valid in all European countries.

The first fire-stopping products holding an ETA are already on the market. The feedback from relevant stakeholders, such as installers, specifiers and inspection bodies, confirms that fire-stopping products with an ETA and a clear defined field of application really increase the level of safety and reliability of these systems. IFP

Markus Schneider is Code & Approval Manager at Hilti, an Association of Specialist Fire Protection member company

For further information, go to www.asfp.org.uk or www.hilti.co.uk

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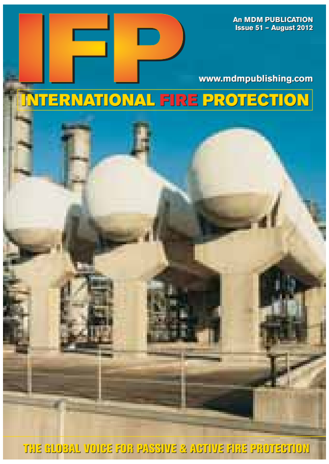

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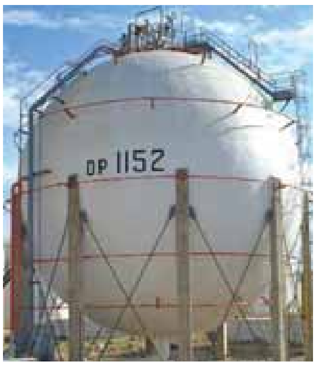

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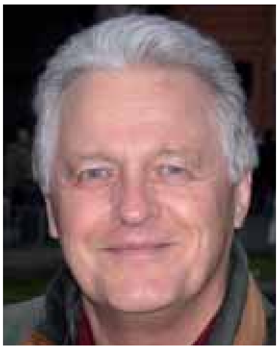

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What's in a Word?

It is probably not stretching things too far to suggest that the majority of fire safety legislation around the world has been in response to particularly devastating fires, often those that have resulted in loss of life or serious injury. In itself, this is no bad thing, as it does indicate that lessons are being learned and that steps are being taken to stop a reoccurrence.

This process is not, however, replicated uniformly across the world. In some countries, most notably in those with fast emerging economies, fire safety legislation often appears to be enacted on a "me too/must have" basis. It is seen as something that having it on the statute books is an end in itself. This is where, for whatever reason, passing a piece of legislation or setting a standard, is not the same thing as ensuring that the standard is universally adopted and properly enforced.

If you read the International Fire Protection (or those of the sister publications International Fire Fighter and Asia Pacific Fire) monthly electronic newsletters, you may have been struck by the number of times that comments similar to: "… it looks as though fire safety standards have been ignored …" are made by the fire service or local authority. Ironically, this is all too often the authority that is – in theory at least – responsible for enforcing the standards. It is also commonplace to read that a particular building's use was found to be "illegal" or that it did not have the necessary certification or approvals. Evident overcrowding and a complete disregard for safe evacuation regularly accompany these statements.

Clearly, in these cases, what is most immediately needed is the resolve to enforce existing standards, and not merely to add further legislation that may well go down the same track to being ignored.

Even in developed nations it is not necessary to delve far into the past to find a time when concerns about safety were, shall we say, less than paramount. In those countries where standards are anything but "the standard" this is undeniably still the case. Not only are fire detection and alarm installations and evacuation procedures frequently given scant attention, so too are building codes and standards of construction.

Changing such a well-entrenched mind-set is a gargantuan task because it can strike at the very culture of the country. It is certainly not a task that is going to be achieved overnight. Significantly, dislodging apathy and disregard for fire safety standards does not mean enacting more standards and codes of practice; it means creating an environment where first the existing standards are complied with consistently.

While not being smug in the misguided belief that any country is free from ignoring or misinterpreting standards, we should all do our utmost to encourage and educate those responsible in every country to fully comply with the prevailing standards. This does not mean influencing just those responsible for policing the standards; it means changing the attitudes and behaviour of those responsible for zoning decisions, town planning, and designing, constructing, managing and maintaining buildings.

The imposition of meaningful penalties has a part to play, but relying on forcing change is likely to be less effective than encouraging change. What we need to do is encourage the willing adoption of standards rather than threatening with a big stick. Sharing information and attitudes across national borders will not alone bring about a greater adherence to standards, but it should go some way towards redefining the word. Getting the importance of standards understood may well be the first step on the road. IFP

Improved Sprinkler Performance

Tank design and manufacturing company, BALMORAL TANKS, has introduced a new vortex inhibitor that is being promoted as offering significant technical improvements over current market options. The new component compliments the company's range of fire protection sprinkler water storage tanks.

These require large, fast flowing volumes of water and vortex inhibitors play a vital role by preventing air being drawn into the system, which would ultimately reduce the flow rate; a highly undesirable situation should a fire occur. Approved to LPCB LPS 2070 and BS EN 12845 standards, the new inhibitor provides a 30 percent reduction in pump suction pressure requirements.

As LPCB standards demand that the water level be no less than 100mm above the tank's lowest suction point, the height of the vortex inhibitor also affects the usable water capacity. The low profile design of the Balmoral vortex inhibitor results in the effective capacity of sprinkler storage tanks being increased by as much as 2.2 percent.

For more information, go to www.balmoraltanks.com

Tough Enclosure

STI (EUROPE) has launched a new safety device for harsh environments, such as wash down areas and saline atmospheres. Called Enviro Stopper, it is an IP-rated protective enclosure designed to extend the life and reliability of devices exposed to water and harsh environments. STI says it offers protection to manual call points and switches against dust and water ingress both external and inside, as well as preventing tampering, vandalism and damage from accidental or malicious operation.

It consists of a clear, tamper-proof, tough polycarbonate cover (IP56) and back-box (IP66) that can accommodate a standard European call point or switch. When the cover is opened a deterrent alarm is emitted and will draw immediate attention to the area. When the cover is closed, the unit is sealed and achieves an overall rating of IP56, preventing dust, grime and water getting to the device. It is available in red, green, yellow, blue, white and black.

For more information, go to www.sti-europe.com/uk/

Smart Detection

KENTEC ELECTRONICS has launched what it describes as: "a revolutionary new concept in life safety system management," heralding its new Taktis as: "a very powerful and sophisticated fire detection and alarm system that is elegantly simple to use and understand." It is designed to also deliver a wide range of other control and indication applications, with seamless integration to a building's management system.

Taktis Fire is an all-new range of networkable fire control panels ranging from two loops to 16 loops with a touch-screen, full colour graphical LCD for fire detection, system monitoring and platform configuration. Taktis Vision is a range of configurable touch-screen annunciator panels for system status indication of functions, such as sprinkler indicators and lift alarms. Taktis Virtual Resource is a suite of software-based tools that provide a complete systems management environment, allowing detailed data to be collected from connected fire alarm systems and stored for later analysis, while also demonstrating traceability of documentation.

Remote access and management, with intelligent analysis of collected data, allow Taktis users to realise many extensive networking applications, with direct integration into intelligent buildings and remote systems interrogation via the user's preferred channels. This exploits the power of the Internet and GSM, including instant messaging to any number of email or SMS recipients.

For more information, go to www.taktis.co.uk or www.kentec.co.uk

End-to-End Detection

FIRE FIGHTING ENTERPRISES has launched its Fireray 3000 end-to-end optical beam smoke detector with international approvals. In addition to its existing UL certification, it is fully CPD certified and approved through VdS, and is designed to offer a cost effective option for protecting large, open area spaces and in situations where a reflective beam system would not be best suited.

An end-to-end system, such as the Fireray 3000, is ideal where reflective objects near the beam path or bright direct sunlight may hamper a reflective system's effectiveness. The low-profile design of the new detector and control panel may also better suit the surroundings, fitting in well with either modern aesthetics or discreetly hiding in ornate decorations.

For more information, go to www.ffeuk.com

Hanger Fire Protection

CHUBB FIRE & SECURITY UK has won a contract to install a sophisticated fire detection system to protect valuable aircraft and equipment within a large aircraft storage hangar at BAE Systems' Warton site in Preston, Lancashire. The general purpose hangar, which is the largest on-site, is used to store both operational aircraft and those being serviced.

The installation comprises 13 aspirating smoke detectors and interfaces with a deluge system that triggers a foam and water sprinkler system in the event of a fire. Chubb is also contracted to maintain and service the system for the first 12 months.

For more information, go to www.chubb.co.uk

New LED Luminaire

COOPER LIGHTING AND SAFETY has introduced the i-P65, a new LED emergency luminaire that can be used on escape routes, in open areas or as a single- or double-sided exit sign with a viewing distance of 20 metres. As its name suggests, the luminaire is sealed to IP65 standard to protect it from dust and moisture and is suitable for both indoor and external applications.

Utilising two high-output 1W LEDs with an estimated life of 60,000 hours, the i-P65 is said to offer ease of installation, low power consumption and minimal maintenance. Its optic design makes efficient use of the light from the LEDs to provide uniform distribution with either an asymmetric (rectangular) pattern for escape corridors, or symmetric (square) pattern for open-area anti-panic illumination. The efficiency of the optics maximises the distance between luminaires, reducing the number of fittings required and minimising both installation and maintenance costs.

Suitable for surface mounting on ceilings or walls, the i-P65 features a NiMH battery and a first-fix base with heavy-duty connector. Both the body and gear tray are made from tough polycarbonate, and the luminaire has overall dimensions of 263mm by 142mm by 55mm. It is available in self-contained or slave versions and can be specified with self-test or addressable testing facilities if required.

For more information, go to www.cooper-ls.com

FM Approved Sprinkler

The VIKING CORPORATION has introduced a new FM-approved version of its dry ESFR (Early Suppression Fast Response) pendent sprinkler. The new model VK502, which complements Viking's existing UL Listed model VK501 dry ESFR sprinkler, is claimed to eliminate the need for in-rack sprinklers and a dry or pre-action system in certain freezer and cold storage applications.

Viking's ESFR sprinklers, which must be installed on a wet-pipe system, are suitable for cold storage facilities where the system piping is installed in a heated space above the freezer area. In these applications, the VK501 (UL) and VK502 (FM) sprinklers reduce the installed cost of a fire sprinkler system by providing ceiling only protection, without the additional costs associated with a dry or pre-action system, including an in-rack sprinkler system, detection system, air maintenance system, low point drains, and other components.

Each dry ESFR sprinkler is shipped with two insulating boots. These boots, which are installed above and below the ceiling penetration, help to seal the clearance space around the sprinkler's barrel, decreasing the potential for condensation and ice to build-up around the sprinkler. Both the VK501 and VK502 are offered in a single barrel length of 900 mm. The 74°C sprinkler is available with a 50 mm grooved or 40 mm threaded connection.

For more information, go to www.vikinggroupinc.com

False Alarm Focus

The FIRE INDUSTRY ASSOCIATION (FIA) has launched a new website dedicated to reducing false alarms that are a huge drain on both financial resources and time.

It is estimated that false alarms cost the UK alone in excess of £1 billion a year. The new FIA false alarms website is aimed at helping everyone cut the cost of false alarms to businesses and the fire services. It can be found at www.fia.uk.com/en/cut-false-alarm-costs.

For more information, go to www.fia.uk.com

Simple Specs

The UK division of SIEMENS BUILDING TECHNOLOGIES has introduced a new downloadable version of its free SpecWriter tool that, the company claims enables: "the easy, guided creation of cost efficient, accurate and sensible specifications for fire safety systems".

SpecWriter is kept up-to-date through online updates including developments in standards and sound engineering practice as well as emerging and time-proven technology, enabling consultants and engineers to create professional fire safety specifications by responding to a series of logical performance-based questions. This says Siemens, ensures that the specification created best meets the needs of the particular project, while adhering to the specific legislative requirements of the country and location of the site.

The UK's new enhanced version not only allows accurate specifications to be created for fire detection and alarm systems, voice evacuation and fixed extinguishing systems individually; it also simplifies creation of a single specification for sites with systems featuring a combination of fire detection and alarm systems, voice evacuation and/or fixed extinguishing.

For more information, go to www.siemens.co.uk/buildingtechnologies

Titanic Voices

BALDWIN BOXALL has supplied a voice alarm system and disabled refuge and toilet alarm systems for one of Britain's latest tourist attraction, the Titanic Belfast building, in the heart of Belfast's historic ship yard – birthplace of the tragically-fated RMS Titanic trans-Atlantic liner. The venue boasts nine galleries that take visitors through the life of the Titanic from its concept to the sinking 100 years ago and its influence up to modern times.

The building is a complex structure where not a single right angle is in view throughout the attraction. DJ Kilpatrick of Belfast, working closely with Baldwin Boxall, designed the voice evacuation system to ensure a high level of speech intelligibility in every area. This called for careful thought regarding the placement of the loudspeakers, as there had been concern about potential overflow within certain areas, especially the atrium.

An eight-zone centralised voice evacuation system enables phased evacuation from all areas of the building. Inputs to the system include background music, localised paging microphones, multi-zone microphones and all call fire microphones. The system employs DC line monitoring technology.

The Vigil Omnicare disabled refuge and toilet alarm system enables two-way communication between building management and areas of refuge for those that may need assistance during an evacuation. Two separate systems were installed. The first was a six-way system for the car parks with the second being a larger, 46-way system, for the attraction.

For more information, go to www.baldwinboxall.co.uk

Safety Cabinet

A new range of cabinets to protect critical process equipment in hazardous areas against very high temperature fires has been launched by INTERTEC.

The cabinets ensure that equipment, such as emergency shutdown valves, remains operational by keeping it below 60°C for periods of up to 90 minutes in the event of a hydrocarbon-based fire, allowing time for controlled shutdown. Passive fire protection cabinets for process plant protection applications are usually only required to provide 30 minutes of protection. However, the 90 minute protection provides a broad margin of safety to enable plant operators to continue remotely controlling critical valves to ensure that the process cannot feed the flames with flammable materials, or that vessels do not burst from over-pressurisation.

The new 90-minute protection capability has been tested against the ANSI/UL 1709 standard by the test body MPA Dresden.

For more information, go to www.intertec.info

New Engineered Total Flooding System

FIRETRACE INTERNATIONAL has unveiled its new Engineered Systems, which it predicts will redefine the global total-flooding gaseous fire suppression market.

In addition to incorporating a number of innovative engineering developments, the new Engineered Systems from Firetrace are said to offer system installers greater flexibility, speedier installation, significantly lower overall installed cost and a measurable competitive edge. End user benefits come in the form of a lower financial outlay when compared with other systems on the market, significantly improved design freedom, and a swift, least-cost transition from an existing Halon system to the latest clean agent technology and delivery solution.

Firetrace's Engineered Systems offer 500 psi (34.5 bar) high pressure efficiency while utilising low pressure hardware. The system is designed to slash the amount of piping used, with savings on distribution network alone being quoted as typically between 25 percent and 40 percent. At the same time, the bugbear of having to accurately equally balance the amount of agent at Bull T and Side T connections has been overcome, plus extra pipe lengths between tees is either minimal or completely unnecessary. With Engineered Systems, the Bull T split can be up to an 85/15 split, while the Side T can be as much as a 95/5 split.

The actuation system has been designed to be stackable, and the cylinder storage problems often associated with gaseous total flooding systems have been overcome. With the new Firetrace offering, the distance between the agent storage cylinder and the discharge nozzle is claimed to be more than three times longer than old-technology systems on the market, significantly increasing the vertical distance capability. The liquid agent to pipe volumes are up by 500 percent; and higher fill density means more agent in the same hardware. All of this is achieved without the need to incorporate expensive Nitrogen driver systems, so installing the largest possible networks without having to resort to incorporating extra equipment.

Firetrace believes that as many as 75 percent of existing Halon distribution networks can be easily and cost-effectively refitted with its Engineered Systems utilising the existing piping. Its Engineered Systems fully comply with every aspect of NFPA 2001: 2012, the standard on clean agent fire extinguishing systems.

For more information, go to www.firetrace.com

Taking Customer Experience to a New Level

Kidde Fire Protection (KFP) is a global leader in the manufacture of a wide range of clean agent gaseous fire suppression systems designed to suppress fire at the earliest possible stage.

With years of experience and knowledge in fixed suppression systems, Kidde engineers are experts in the manufacture, design and application of Argonite, DuPont FM-200, 3M Novec 1230 Fire Protection Fluid and CO_2 systems that are used to protect a diverse range of industrial processes.

KFP's gaseous suppression systems are fully compliant with all pertinent European Standards, for example TPED and CPD, and have full component and system approvals from at least one globally recognised approval body, such as LPCB, UL or FM.

KFP is accredited via the ISO 9001:2000 quality management system, ensuring that all products are rigorously tested and inspected to ensure consistent reliability. Furthermore, KFP is a part of UTC Climate, Controls & Security, and is committed to Achieving Competitive Excellence (ACE), a United Technologies Corporation proprietary operating system that is designed to ensure best-in-class quality in products and processes. ACE is a combination of lean manufacturing and quality improvement processes that results in eliminating waste, increasing efficiency, and improving

customer satisfaction. ACE provides a set of tools that helps identify process improvement opportunities, solve problems and assist with the decision-making process.

As part of its relentless mission to increase efficiency and reduce waste, KFP also complements its ACE activities with ISO 14001 certification. This certification helps it identify and systematically develop environmentally sustainable processes to lower energy and raw materials use, and reduce waste and pollution. For example, KFP developed

an innovative mass flow cylinder filling process for chemical agents (FM200 and Novec 1230), which ensures nitrogen adsorption into the agent as the cylinder is accurately filled in a highly controlled process.

Kidde knows that innovative, environmentally responsible products need to be complemented by fast and efficient customer service. Time is usually of the essence, which is why KFP has systems in place that give customers the utmost confidence that their orders will be supplied in-full, on-time and at a competitive price.

Throughout its history, KFP has been committed to establishing relationships with the very best channel partners. Firecheck Contracts Ltd and Fire Protection Group (FPG) Ltd have recently been appointed to distribute KFP's gaseous fire suppression systems throughout the UK, and both companies are renowned for their industry expertise.

This latest announcement is just one aspect of the company's strategy to grow. Maintaining leading filling, storage, assembly and distribution processes are at the very heart of achieving future growth. By implementing a range of clearly defined processes and procedures, KFP is able to process and supply orders quickly and efficiently. This has resulted in up to 75 percent reduction in standard lead times, not only meeting, but exceeding, customers' expectations. KFP's commitment to continuously improve its operations combined with the appointment of UK distributors – Firecheck and FPG – positions KFP to provide the highest customer service.

When it comes to procuring the very best in fire suppression equipment, KFP's customers can be confident that the quality of product they receive will be matched by the service they expect. IFP

For further information, go to www.kfp.co.uk

Pressure's On the Eiffel Tower

SETE, the company that runs the Eiffel Tower in Paris selected a VICTAULIC pre-action system when installing a new fire protection system that would provide the highest possible level of safety for a construction that is 324 metres high and visited by around seven million people each year.

The Victaulic pre-action system was selected for its pressure rating of up to 21 bar where most systems are rated only up to 17.5 bar. It is approved by the CNPP (National Centre for Prevention and Protection); a major consideration on this project, as it would have been difficult to insure such a public building without it. The pre-action system in the Eiffel Tower can also be easily drained and reset if the alarm is activated.

The 500-head sprinkler system in the tower is supplied by a column of pressurised water that rises from the mechanical room all the way up to a height of 100 metres on the second floor. The system provides fire safety in the public areas of the tower, in the kitchen, where temperatures of up to 141°C are created, and in the restaurant on the second floor. It is sensitive to varying degrees of heat (68°C in the restaurant and buffet, 93°C in the general kitchen area and 141°C next to the chip fryer).

For more information, go to www.victaulic.com

Evolutionary Advance

NITTAN EUROPE has announced that its Evolution fire detection range is now supported by Advanced Electronics' Mx-5100N single loop control panel. Mx-5000N is the latest generation of analogue addressable fire alarm control panels that are fully compliant with EN54 part 2, 4 and 13. The panels have been designed to be flexible and powerful with an intuitive user interface featuring a high resolution LCD display and tactile keypad.

The Mx-5100N, the first in a full Mx-5000N series of Evolution compatible panels, comes complete with a single loop driver card, two on-board sounder circuits, 20 programmable zonal LEDs and four dedicated programmable push buttons. It is compatible with the full Evolution range from Nittan.

Evolution uses ASIC technology in the sensors and sophisticated detection algorithms, combining reliable fire detection with a very high degree of protection against unwanted false alarms. Its protocol is not only uniquely resistant to noise, it also allows for substantial amounts of information to be transmitted at high speed.

For more information, go to www.nittan.co.uk

Revised Standard – Take Note

EXOVA WARRINGTONFIRE is urging the fire protection industry to be fully aware of the implications of two new revised parts of a key European standard being published soon. The EN 13381 series of standards, which concerns test methods for determining the contribution to the fire resistance of concrete structures, has recently been revised to take into account changes in test and assessment methodology.

The revised parts three and six will be issued shortly as European-wide standards and also by the British Standards Institute as BS ENs. Part three relates to the testing and performance of concrete elements with applied fire protection products, while part six deals with the fire resistance testing of protected concrete-filled structural steel hollow columns.

For more information, go to www.exova.com

IP-Enabled ASD

SYSTEM SENSOR EUROPE has moved into ultra-sensitive aspiration detection with the introduction of Faast, an EN54-20 Class A approved very early warning aspiration system that, it is claimed, will alarm more than an hour before combustion.

Faast is being targeted at enterprise critical operations such as data centres and IT/telecoms facilities, where revenue loss and reputational damage due to disruption are not acceptable. It is also being aimed at installations in large open spaces such as airport concourses, and for challenging environments where hot or cold temperature extremes, or poor air quality, are present.

It includes a number of unique hardware and software features such as integral IP connectivity, which enables remote monitoring and management over the Internet, and the use of System Sensor's digital Advanced Protocol to communicate with the fire control panel. This enables both point and aspiration detectors to be integrated into a single overall fire system, reducing total cost of ownership.

Other features being cited include: super sensitive detection of 0.0015%/m; multi-angle and multi-wavelength optics and complex algorithms to differentiate combustible particles from dust particles; and three-stage filtration, which includes a filter to prevent particles larger than 20 microns from entering the detection chamber.

For more information, go to www.systemsensor.com

Foam Approval

The UK's largest airport operator, BAA has awarded Dr Sthamer the firefighting foam contract for its Moussol FF, a fluorine-free firefighting foam that has been tested and certified to pass the requirements of the International Civil Aviation Organisation's Level B standard. This included independent verification of the firefighting performance to the ICAO Level B standard at the CNPP Laboratory witnessed by UK CAA and BAA personnel.

Dr Sthamer's Moussol FF foam was developed to meet the stringent requirements of the aviation industry and BAA's environmental requirement to be 100 percent biodegradable within 28 days. This allows the airport rescue fire services to train with the actual foams they will respond with in real fire scenarios. The foam is already in use at London Gatwick and Southend Airport in the UK and all of Norway's and Sweden's airports and Finland's regional airport.

For more information, go to www.sthamer.com

Ductwork Guidance

Fire-resistant ductwork systems manufacturer, FIRE PROTECTION LTD has released a new *Guidance Note for Specifiers and Purchasers of Fire Rated Duct Systems.* It is claimed to bring together all of the relevant guidance on fire resistant ductwork for anyone involved in the design, specification, purchase, maintenance and management of such systems.

The 44-page Guide covers the regulations and standards that apply and provides additional information and comment to assist users in specifying and purchasing the correct fire resistant duct system for every application. It also explains the recommendations of various standards including BS 9999: 2008: *Code of Practice for fire safety in design, management and use of building*; BS 476: Part 24:1987; ISO 6944: 1985 and the Association for Specialist Fire Protection Blue Book – Fire Resisting Ductwork.

For more information, go to www.fireprotection.co.uk

2012 IWMA Conference Goes to Barcelona

The past 15 years have been distinguished by significant advancement in the commercial application of water mist fire suppression technology throughout the world, so the 2012 IWMA conference in Barcelona, Spain in November has much to offer.

The Montreal Protocol opened the way for water mist technology as replacement for Halon. More than a decade of research and development on water mist systems has revealed a broad variety of applications where this technology can replace not only ozone depleting chemical agents; it also represents a measure equivalent to standard sprinklers. The undisputed environmental advantages embodied in water mist systems combined with efficient firefighting characteristics will certainly contribute to its continued success in the future.

The IWMA

Some years ago a logical conclusion of the continuous development of water mist technology throughout the world was the creation of the IWMA – the International Water Mist Association. For more than ten years the IWMA has supported research, development and the use of water mist technology worldwide. Until then the IWMA provides a platform and a forum for all interested parties active in this field; manufacturers, distributors, insurers and approval bodies, research bodies and private individuals.

The on-going success of water mist systems will strongly depend on reliable codes and standards. IMO has been the driving force that developed guidelines and test protocols for the use of water mist on ships. NFPA, UL, FM, CEN have developed guidelines and test protocols for land-based applications, but there are still gaps to close. It is currently the major task of the IWMA to support the further development of a European Standard for water mist systems.

The revision process of Technical Specification 14972 is not finished yet, so has not yet been transformed into a European Standard. This transformation, however, is urgently needed to serve the market with mandatory rules all market players can rely on. Basically, this missing standard currently prevents water mist technology from further spreading throughout Europe. Potential users are hesitant because of the lack of a binding document.

As IWMA had proposed, the first step should be the finishing of the general design and installation standard. The second task should be to add step-by-step test protocols for certain applications.

IWMA Conference 2012

This topic will be certainly discussed in depth during the next IWMA conference in the World Trade Centre in Barcelona on 14th and 15th November.

Many experts and researchers from around the world will present the latest findings on water mist technology, will define the current state-of-the-art of this fire protection technique and will, using case studies, describe the latest applications. The current situation on standards and test protocols will also be discussed. The conference language will be English and Spanish, so Spanish-speaking delegates may take advantage of the English-Spanish translation.

This will be a truly international event; delegates from more than twenty countries will make it once more a worldwide come together. Save the date and join this excellent networking opportunity to meet all major researchers, manufacturers, distributors and others interested in the field. Meet the number-one experts in water mist technology from around the world at the World Trade Centre Barcelona; a very special conference location where you might even get the chance to see a cruise liner equipped with a water mist system just few steps away from the conference centre. IFP

For more information, go to www.iwma.net

New Touchscreen-Controlled Addressable Fire Panels

C-TEC has launched a revolutionary new range of two to eight-loop touchscreen-controlled analogue addressable fire alarm panels.

Costing over £1.5 million to develop, the ZFP is C-TEC's most ambitious project yet. Fully compliant with EN54 parts 2 and 4, the ZFP's Hi-Net high-integrity network can accommodate up to 128 nodes (of which 64 can be control panels) and over 10,000 programmable and indicatable detection zones. The control module's intuitive 4.3 inch, 472 x 248 pixel colour resistive touch-screen provides clear and constant feedback on all aspects of system activity and its on-screen QWERTY keyboard makes programming and installation very straightforward.

C-TEC's MD, Andrew Foster, explains how the product came about: "Back in 2008, a team of engineers at our R&D department were tasked with creating a powerful multi-loop fire alarm panel with massive capability, one which would position C-TEC at the forefront of the fire alarm industry and way ahead of our competitors." He continues: " We envisaged a panel of a modular and highly flexible nature to allow systems to be quickly and easily 'built-up' to suit the requirements of any site and designed a vast range of switch and indicator modules and 'A-Bus' peripherals to slot into the panel. We also decided that the ZFP would be touchscreen controlled and commissioned a full colour high-spec LCD screen."

Andrew adds: "Obviously the capacity of the panel was also a key consideration. With its potential to create systems featuring over 100,000 addressable devices, the ZFP is certainly very powerful. Long before we added the finishing touches of a slide-in label system, 20-way heavy duty brass earth bar and a galvanically isolated USB port, it was clear that we had created an incredible piece of equipment that was capable of doing more than we ever thought possible."

He concludes: "We committed a significant amount of money to developing this product. However, the ZFP has exceeded all our expectations and I confidently expect this investment to reap huge dividends. The launch of the ZFP marks a new beginning for C-TEC. This incredibly innovative panel undoubtedly places us in our rightful place – at the forefront of fire alarm technology."

As well as having access to a range of 'standard' off-the-shelf ZFP panels, customers can select a ZFP configuration to suit their exact requirements for larger, more complex projects. Three master cabinet sizes are available and all come with a control and display module, a two-loop main PCB and a 3A or 5A EN54 PSU. Depending on the application and cabinet size selected, additional indicator and switch modules can be added, together with other options such as additional loop drivers, a network card, one or more A-BUS PCBs, flush mounting bezels and more.

C-TEC is one of the UK's leading independent manufacturers of life-safety equipment including fire alarm control panels, call systems, voice alarms and disability equipment. Currently celebrating its 30th Anniversary, the company has recently been nominated as one of the UK's outstanding examples of manufacturing excellence in the British Government's prestigious 'Made by Britain' initiative. IFP

For more information, go to www.c-tec.co.uk


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The CARE Family

The concept of disabled refuge areas and emergency voice communication (often referred to as EVC) systems was introduced when BS5588-8 was published in 1999 and BS5839-9 in 2003. BALDWIN BOXALL was quick off the mark and developed its CommuniCare system in 2001.

This system, believed to be the first of its kind on the market, fast became popular. Close behind CommuniCare came the introduction of FireCare fire telephone system. This was followed by AssureCare (emergency call point) and CommuniCare Advance (an advanced version of CommuniCare with outstations that included braille, induction loop and raised luminescent text). These four systems sold in large numbers and there are many still in use today.

The British Standard BS9999 (*Code of practice for fire safety in the design, management and use of buildings*) was introduced in 2008 (superseding BS5588) that, among other things, reiterated the need for disabled refuge areas and fire telephone systems.

Over the years, the demand for Care systems increased and many sites opted to install more than one type when, for example, they had a requirement for a disabled refuge system as well as for fire telephones. This involved the need for two sets of wiring, two control panels (more if the systems required networking) and independent installation and commissioning processes. Clearly, something needed to be done.

The first system of its kind – OmniCare – was developed by Baldwin Boxall in 2008. With OmniCare, installers were able to install a single system that included all types of emergency voice communication. However, Baldwin Boxall did not stop there. The company introduced new styles of outstation to the range: green emergency (steward) telephones; a combined fire telephone and disabled refuge outstation; and even the ability to connect disabled toilet alarms. As with its predecessors, OmniCare remained a loop-wired concept.

In 2011 BS5839-9 was updated and Baldwin Boxall quickly made the necessary adjustments to the OmniCare system. One of the changes, most noticeable to customers, was that a disabled refuge remote should be green in colour (OmniCare formerly being red). In order to comply with the new Standard, green signage was supplied with the stainless steel remotes and a new green version introduced.

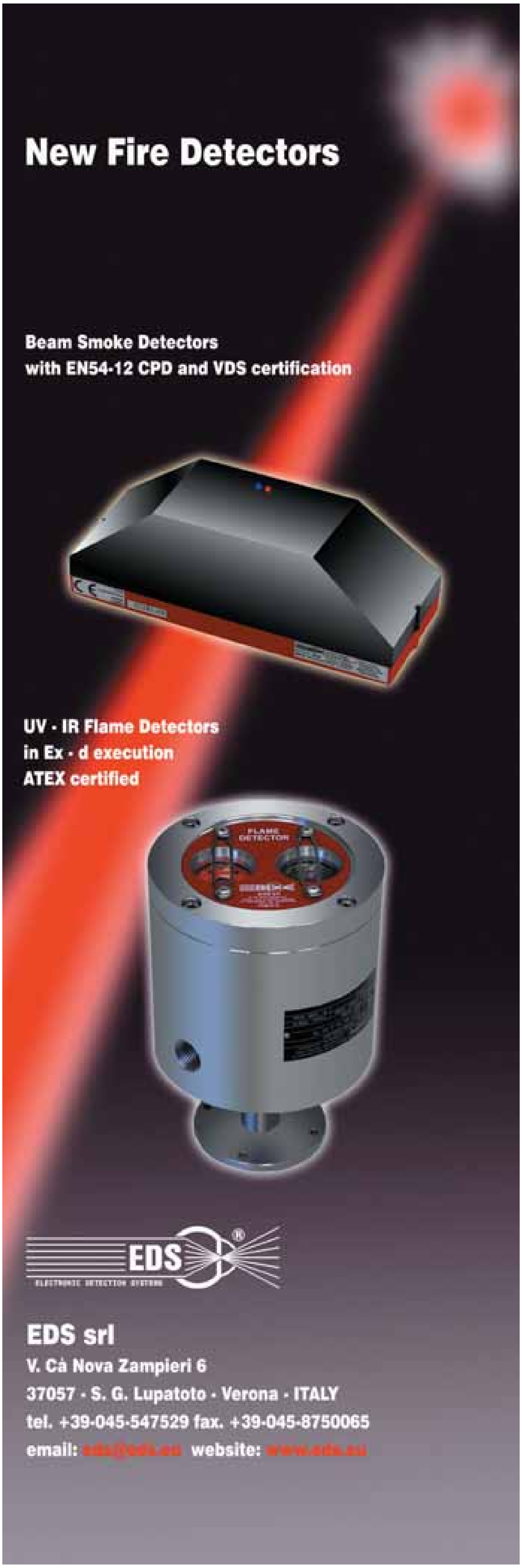
OmniCare is as popular as ever and in constant production at the company's factory in East Sussex, UK. Never wanting to "stand still", however, the R&D team at Baldwin Boxall developed Care2. Introducing a new method of control (rotary encoder), the new system was introduced in April this year.

Care2 is radial wired and features a bright clear LCD with a rolling display. The user simply scrolls through the menu and pushes the encoder to make the relevant selection. Easy to install and use, Care2 (in common with OmniCare) has the ability to include a variety of outstations from one console. Outstation options for the Care2 include disabled refuge, fire telephone, emergency (steward) telephone and roaming telephone handsets (and jack sockets) – with disabled toilet alarm soon to be added.

An added benefit of the Care2 system – and a unique feature – is that the roaming telephones, while stored in the specially designed enclosure, are monitored. This means that should a handset fail or be removed from the enclosure, the operator is notified. The introduction in October this year of networking facilities and the ability to add disabled toilet alarms to the system is expected to increase levels of demand.

Baldwin Boxall still has the occasional request for additional outstations or unit spares for the original four Care systems, which it continues to support and will do so for as long as is practical. The introduction of Care2 is seen as providing an additional option to installers and will be manufactured alongside the OmniCare system. IFP

For more information, go to www.baldwinboxall.co.uk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LEADING THE WAY TO SAFETY

New materials present new challenges

Fire and Façades

Andy Dean

Exova Warringtonfire

A number of serious building fires have triggered significant public concern over the safety of façade materials. But, what issues are involved, how might the industry respond, and what questions does it raise for the future?

Spacing buildings apart to prevent the spread of fire is not a new idea – it can be traced back to the Great Fire of London in 1666, when the streets were narrow with wooden buildings close together. This allowed flames and heat from one building to set fire to others across the street.

It is said that one of the strategies used by King Charles II to stop the fire spreading was to demolish perfectly good buildings to create 'fire breaks'. This principle is still widely used today, with building codes all over the world stipulating that buildings must be spaced apart to prevent a fire in one building spreading to others.

The advent of high-tech fire resistant façades is a relatively new development and means fire-rated buildings can be placed much closer together. Most buildings do not need such high specification façade materials because they are appropriately spaced. This level of fire rating is also extremely expensive and not economically viable for ordinary buildings. Many codes do not require the façade to be fire-rated if other systems are used, such as internal sprinkler systems or perimeter fire stopping.

Understanding 'Fire Resistance' & 'Reaction-to-Fire'

Firstly, it is important to understand the difference between 'reaction-to-fire' and 'fire resistance'.

- **Reaction-to-Fire**

Reaction-to-fire mainly deals with materials: if they burn (combustibility); how easily they burn (ignitability and flame spread); and what happens when they burn (smoke development and resulting toxicity).

Reaction-to-fire focuses on the response of materials during the development of a fire, so, for example, concrete, paper, wood, plastic and paint will each register very different reaction-to-fire performances. The result is often a material classification that is used by designers to ensure the right material is in the right place with the aim of preventing a fire from starting, or limiting its spread.

- **Fire Resistance**

Fire resistance, on the other hand, mainly addresses building systems (such as walls, floors, ceilings, and doors) and their compartmentation abilities – for instance, when a fire is fully developed in a space or room, how long will it take for that fire to burn through a system into an adjacent space? Fire resistance performance is always measured in terms of 'time' and is used by designers to make sure potential fire spread from one compartment to another is quantified. This is an important consideration when designing a building because it will enable people to get out in time, as well as limiting damage to property.

FAÇADE FIRE SAFETY

A building fire safety strategy is crucial

Why Perimeter Fire Stopping is Crucial

Whether or not the façade of the building has a fire resistance capability, it must also perform in at least two other important fire-related ways. Firstly, the materials used have to limit flame spread – and it is lamentably apparent that some of the materials used on the buildings in the recent fires were not suitable. Secondly, where 'compartmentation' is required by the fire safety strategy, the gap between the façade and the building (typically at the floors), must be sealed to limit fire spread between rooms. This is called 'perimeter fire stopping'. It is extremely important, but can become ineffective if the materials used in the façade enable the fire to bypass this seal.

When looking into the flame spread characteristics of a façade, it is important to evaluate the materials used in its manufacture. In particular, the combustibility, ignitability and spread of flame across the surface must be evaluated.

Some test methods traditionally used to determine a material's fire-related performance may not be appropriate for some façade materials. For example, the ASTM E84 ('Steiner Tunnel') and EN ISO 13823 (the single burning item or SBI) tests that are used as part of the classification systems in key international regions are not, in isolation, sufficient to prove adequate performance. The reason for this is that these tests are often not aggressive enough, in terms of flame and heat, to challenge the material effectively.

When looking into the flame spread characteristics of a façade, it is important to evaluate the materials used in its manufacture. In particular, the combustibility, ignitability and spread of flame across the surface must be evaluated.

For example, a common material used in façades is ACP, or aluminium composite panelling, which falls into the genre of metal composite materials (MCM). Non-fire rated versions of ACP often comprise a two millimetre to five millimetre core of low density polyethylene (LDPE) sandwiched between two layers of aluminium (generally 0.5mm thick on

A Fire Safety Strategy – The Main Points

Any fire performance component used in a building should function as part of the building's fire safety strategy. This is a written plan that explains the design philosophy of the building in the case of a fire.

It sets out the codes and standards in the design; the rationale of the design; escape routes; alarm and warning systems; requirements for compartmentation and fire protection to prevent building collapse; occupancy type and number of people; provisions to help firefighting operations; and any limitations on the use of the building.

All large or complex buildings should have a fire safety strategy and the associated report is an essential document for the owner, the design team, regulatory authorities, firefighters and first responders, along with the operator of the building.

The fundamental principles of fire control are prevention and containment. Materials should be selected to minimise the chance of a fire developing. Systems should be designed so that if a fire does develop, it can be contained to the greatest extent possible. Containment is intended to provide occupants with enough time to escape, limit fire spread and minimise damage.

each side). The LDPE typically burns ferociously once lit, but the fire has to get through the aluminium before it can ignite the core. The two tests cited above will often not penetrate the skin and therefore never 'release the dragon' inside – as a real life building fire might.

The Need for More Thorough Testing Techniques

The answer to concerns over testing these types of systems is a more aggressive fire test. NFPA 285 or BS 8414 are two such tests. These are performed on full-scale mock-ups with the wall system containing the material fixed to a test wall two storeys high. The tests simulate a fully developed fire, either adjacent to the wall or breaking out from a window. The heat release from these tests is sufficient to properly test the façade and evaluate its performance in spread-of-fire terms.

Turning to fire compartmentation at the perimeter fire stopping, it is important to consider a number of issues. The idea of this system is to stop elements of a fully developed fire travelling vertically between floors, through the gap between the floor slab and the façade. It is essential to keep in mind that this is not just a 'smoke seal'. It is generally expected that the perimeter fire stopping should have the same fire resistance performance as the slab which it abuts.

A Question of Fire Safety

A frequent question is: "So what happens when the glass of the façade breaks (which it generally will do in a few minutes after flashover) and the aluminium of the façade melts (which it will do some time shortly afterwards)?"

This is a pertinent question, but does not remove the need to ensure that the integrity of the fire stopping remains intact once any façade system failure starts to occur. If the longevity and performance of the perimeter fire stop depends on the resilience of the façade nearby, then this resilience must be made intrinsic to the design.

The fire stopping and the façade at this location must act as a system in the case of a fire. This may require the selection of more durable materials that are not going to break or melt once the fire starts, such as fire-rated glass or steel framing or panelling. An alternative – and common – solution is to protect the façade area adjacent to the fire stop so it is insulated from the fire and retains its integrity for a specified length of time.

Tests such as ASTM E2307 or EN 1364 (parts 3 or 4 depending on whether the façade is fire-rated or not) are examples of test methods that can effectively evaluate the fire stopping.

Testing, Testing, Testing

As implied above, the way to establish the reaction-to-fire, or fire resistance characteristics of a material or system, is to test its performance. Testing is performed in specialised laboratories, using both small-scale and large-scale furnaces specifically designed for the purpose.

Another important element in the testing process is the durability of a material. Many specifications and regional mandatory requirements (including European ones) stipulate that the durability of systems and materials is established alongside fire and other performance criteria.

For instance, it would be unsatisfactory to have a fire door with hinges that deteriorate after only a few years, allowing gaps to open between the door and the frame such that the original fire resistance properties of the door become ineffective.

Key Issues of Façade Design

A well-thought-out fire safety strategy and façade design are critical. Making the whole façade fire resistant is usually not necessary, provided that the intended function and performance of the materials is understood in relation to both reaction-to-fire and fire resistance.

Appropriate testing of the materials used in the façade and the perimeter fire stopping systems are two key aspects of ensuring that the façade system and its interface with the building performs adequately in a fire. IFP

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The Benefits of CE

Bob Chapman

Fire Protection Limited

On 1 July 2013, the Construction Products Regulations will come fully into force. So, what are the ramifcations for fire-resistant ductwork?

A fundamental aspect of fire safety within buildings is the simple principle of compartmentation. With regards to duct-work systems that cross compartment walls or floors, adequate compartmentation is maintained via the use of fire dampers or the utilisation of fire resistant ductwork.

In the UK, the current method for the determin-ing whether ductwork is fire resistant is by using systems tested to BS 476 Part 24. However, European Standards for fire rated ductwork covered under product standards EN 15871: *Fire resisting ducting* and EN 12101-7: *Smoke control ducting* are soon to be implemented. From 1 July 2013, the Construction Products Regulation (CPR) will come fully into force necessitating the mandatory requirement to CE mark products that are covered by a harmonised European Standard (hEN).

It is to be hoped that the application and use of CE marked systems will enable compliance with codes like BS 9999 to become simpler. It should also assist regulators and specifiers to judge the appropriateness of a fire rated ductwork system for its particular application.

CE Marking

In its simplest definition, a CE mark indicates a product's compliance with relevant EU legislation as it applies to that particular product type. This confirms the product's validity and enables it to be marketed without restriction throughout the EU. Once a manufacturer applies the CE label to its product it is confirming the product's suitability for the European market and its compliance with EU legislation. The country of origin of the CE-marked product does not have to be within Europe. The CE mark simply confirms that the product meets the legislative requirements to be placed into the European market.

Since ventilation ducts and smoke ducts are covered under EN product standards they will require a CE-mark. There are four EN product standards relating to fire resisting ductwork:

- BS EN 1366-1: *Ducts ventilation, pressurisation & kitchen extract.*
- BS EN 1366-5: *Service ducts and shafts.*
- BS EN 1366-8: *Smoke extraction ducts (multi compartment).*
- BS EN 1366-9: *Smoke extraction ducts (single compartment).*

There are also product construction standards that dictate the actual test criteria that the duct-work must meet, that is, the relevant EN 1366 test standard relating to smoke control or ventilation ducts. The product construction standards apply-ing to fire resisting ductwork are:

- BS EN 15871: *Fire resistant ducting.*
- BS EN 12101-7: *Smoke control ducting.*

So, in order to meet the requirements of the CPR, all fire resistant ducting tested to BS EN 12101 and BS EN 15871 must be CE marked after the 1 July 2013.

The CE marking label must be attached to each duct section and to any tested in-duct equipment. Each duct product category must also be issued with a Certificate of Conformity confirming its

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Marking

performance as part of the fire resistant duct system.

The Benefits of CE Marking

The implemention of CE marking within the fire resistant ductwork market is the most significant change this industry has witnessed in recent years. It is critical that all those involved in the design, procurement and installation of fire resistant ductwork systems are aware of this change in legislation and specify and procure products that are CE marked. They must also recognise that the requirement for CE marked products may also apply to any contracts that bridge the 1 July implementation date.

While the CE marking process is often considered to further complicate the specification and compliance process, there are many benefits, particularly for building control bodies and specifiers. A fundamental benefit of CE marking is that the label itself will confirm technical information about the product, providing performance values for the fire-rated ductwork system. This will assist in ensuring correct systems are installed as specified and not substituted with systems offering lower performance values. In this way, the CE mark acts a technical data sheet. It relates or confirms the performance levels of the fire rated ductwork systems to the defined or governing products standards of BS EN 12101 and BS EN 15871. This will assist in allowing regulators and specifiers to judge the appropriateness of the fire-rated ductwork system for its particular application.

For instance, if ducts are intended for use in smoke control systems, then the label will confirm this accordingly. Similarly, the application and use of CE marked systems will assist in demonstrating compliance with codes, such as BS 9999. For example, a fire rated duct may be suitable for use as a ventilation duct, but may not have been tested and declared suitable for use as a smoke extract duct. The CE Mark label will clearly identify the EN Product Standard, which in the case of smoke extraction systems must be EN-12101-7.

Each CE label will clearly identify ducts as classified for use in the following applications:
- Ventilation Duct.
- Smoke Extract Duct – Single Compartment.
- Smoke Extract Duct – Multi Compartment.
- Kitchen Extract Duct.

What is a CE Mark?

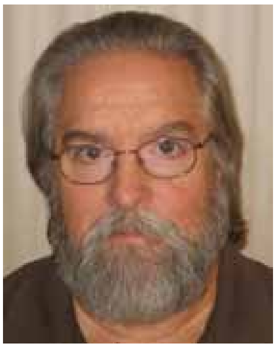
When a manufacturer applies a CE mark to its product it is making a declaration that the product meets the legislative requirements of the European Directives applicable to that product. The letters CE stand for "Conformité Européenne" which means "European Conformity". The CE mark is not a quality mark and should not be confused with a third-party certification mark, such as CERTIFIRE, BSI Kitemark or DNV.

The manufacturer must apply the CE mark to its product following specified principles, which cover aspects including size and visibilty. If a Notified Body was involved in auditing the production control stage then its identification number must be shown. The manufacturer must also produce and sign an EC declaration of conformity proving the product satisfies all the necessary requirements. It is the manufacturer's responsibility to carry out the conformity assessment, to set up the technical file, to issue the EC declaration of conformity and to affix CE marking on a product.

CE marking relates only to a product's properties. Only those properties covered by regulation in at least one member state are included. It does not, for example, cover aesthetics, local regulations or installation. Certain documentation must be kept once the CE mark is affixed to a product. This information can be requested at any time by market surveillance authorities to check that a CE mark has been legitimately affixed to a product. Documentation must be produced in a technical file, which must be made available to surveillance and enforcement authorities for inspection. Material contained will include information, such as methods of manufacture, proof of compliance with national standards, location of manufacture, design details, relevant EU directives.

Further Guidance

To aid local authorities, consulting engineers, contractors and specifiers to understand the information provided by and appreciate what is necessary to obtain a CE mark, Fire Protection Ltd has released a guidance leaflet. This explains the information that should be displayed on the CE marking label and provides a sample Certificate of Conformity. It also offers a useful summary of the classification symbols relevant to fire-resisting ductwork. IFP



Mark L. Robin

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Clean Agents in Total Flooding Applications

Up until the early 1990s, the choice of a clean agent for a total flooding application was relatively simple, as the clean agent market consisted of only two agents: Halon 1301 (CF_3Br) and carbon dioxide (CO_2). Carbon dioxide systems have been employed for more than a century and have extinguished more fires than any other gaseous fire extinguishing agent. However, the minimum design concentration for CO_2 total flooding systems is 34 percent by volume, well above the acceptable exposure threshold for personnel. As a result, NFPA 12 prohibits the use of total flooding CO_2 systems in normally occupied spaces with specific exceptions, and where a gaseous total flooding system was desired for a normally occupied enclosure, Halon 1301 was generally recommended.

Due to its unique combination of chemical and physical properties, Halon 1301 served as a nearly ideal fire suppression agent for over 30 years. However, due to its implication in the destruction of stratospheric ozone, the Montreal Protocol of 1987 identified Halon 1301 as one of numerous compounds requiring limitations of use and production, and an amendment to the original Protocol resulted in the halting of Halon 1301 production in developed countries on December 31, 1993; there is currently no production of Halon 1301 for use in fire suppression applications.

Halon 1301 Replacements

- **Commercialised Agents**

Out of the thousands of compounds evaluated as replacements for the Halons, less than a dozen compounds ever saw commercialisation. Five classes of compounds ultimately emerged as commercially available Halon replacements: hydrofluorocarbons (HFCs), hydrochlorofluorocarbons (HCFCs), inert gases, perfluorocarbons (PFCs) and a perfluorinated ketone (PFK). The perfluorocarbon agents were banned from use in fire suppression in the early 1990s due to their extremely long atmospheric lifetimes and permanent affect on climate change. The HCFC agents are slated for phase-out due to their non-zero ODPs and are transitional replacement agents only.

Table 1 shows the currently available Halon 1301 replacements. Halon 1301 replacements can be separated into two classes based on their mechanism

Table 1: Commercially Available Halon 1301 Replacements

	Designation	Chemical Formula	Trade Name	Manufacturer
HFCs	HFC-227ea	CF_3CHFCF_3	FM-200®	DuPont
	HFC-125	CF_3CF_2H	FE-25™	DuPont
	HFC-23	CF_3H	FE-13™	DuPont
HCFCs	HCFC Blend A	CF_2HCl (82%), CF_3CHCl_2 (4.75%) CF_3CHFCl (9.5%) d-limonene (3.75%)	NAF-S-III®	Safety Hi-Tech
Inert Gases	IG-541	N_2 (52%) Ar (40%) CO_2 (8%)	Inergen®	Ansul
	IG-55	N_2 (50%), Ar (50%)	Argonite™ Proinert®	Ginge-Kerr Fike Corp.
	IG-01	Ar	Argotec	Minimax
	IG-100	N_2	NN100	Koatsu
Perfluorinated Ketone	FK-5-1-12	$CF_3CF_2C(O)CF(CF_3)_2$	Novec™-1230	3M

Table 2. Agent Requirements: NFPA 2001 (2012 Edition)

Agent	Class A Hazard		Class C Hazard	
	Minimum Design Conc., % v/v	Agent required per 1000 ft^3, lb	Minimum Design Conc., % v/v	Agent required per 1000 ft^3, lb
FM-200®	6.7	32.5	7.0	34.1
Inergen®	34.2	36.9	38.5	42.8
Novec™ 1230	4.5	40.7	4.7	42.6

of fire extinguishment: inert gas agents and halogenated agents (HFCs, HCFCs, and perfluoroketone). The inert gas agents extinguish fire via oxygen dilution, whereas the halogenated agents extinguish fire primarily via the removal of heat. On a volumetric basis, the mechanism of heat removal is a much more efficient method of fire extinguishment compared to the mechanism of oxygen dilution.

As a result, the extinguishing concentrations for the halogenated agents typically range from about 4 percent to 12 percent via volume, compared to the inert gas agents where extinguishing concentrations range from approximately 40 percent to 70 percent by volume. On a mass basis, the HFC agents are more efficient than the inert gases or the perfluoroketone. Table 2 provides a comparison of agent requirements on a mass and volume basis for FM-200, Inergen and Novec1230.

• Comparison of Inert Gases and Halocarbons

The higher volumetric requirements of the inert gas agents, along with the differing physical properties of the inert gases compared with the halocarbon agents, has a significant impact on system design and cost. The inert gas agents cannot be compressed to the liquid state, and therefore must be stored as high pressure gases. This in turn necessitates the use of high pressure storage cylinders and high pressure piping for inert gas systems, adding significant cost to inert gas suppression systems. The low volumetric efficiency of the inert gas agents and their inability to be stored as liquids leads to the requirement of a large number of cylinders compared to other Halon replacement systems. This in turn leads to the requirement for additional storage space and increased system footprint, adding further to the cost of the systems.

In contrast to the inert gas agents, the halogenated agents can be stored as liquids, allowing for a much larger mass of agent to be stored in the same volume compared to inert gases. This significantly reduces the number of system cylinders required with these systems compared to inert gas systems. In addition, with the exception of HFC-23, the halocarbon agents can be stored in standard low pressure cylinders and employ standard piping. Due to the requirements of high pressure piping and containers and the large number of storage containers associated with inert gas systems, system costs increase with system size much more rapidly for the inert gas systems compared with halogenated systems

• The Ideal Halon 1301 Replacement

The ideal Halon 1301 replacement, in addition to possessing the desirable characteristics of Halon

Table 3. Comparison of Clean Agent Classes

Ideal Halon Replacement	Halon 1301	HFCs	Inert Gases	Perfluoroketones
Gaseous agent	√	√	√	
Low chemical reactivity	√	√	√	
No effect on biological tissues	√	√	√	
Electrically nonconducting	√	√	√	√
High weight efficiency	√	√	√	
Low agent cost	√	√	√	
Low system cost	√	√	√	
Low storage volume	√	√		√
Low number cylinders	√	√		√
Low cylinder pressure	√	√		√
Low manifold pressure	√	√		√
Low enclosure pressure	√	√		√
Zero ODP	√	√	√	√
Zero GWP			√	
Non-VOC	√	√	√	

1301, is required to have a much lessened environmental impact with regard to its potential for ozone depletion, and also with regard to its potential for contributing to climate change. The ideal Halon replacement would therefore be characterized by the following properties:

- Clean (no residues).
- High fire extinguishment efficiency.
- Low chemical reactivity:
  - Long term storage stability.
  - Non-corrosive to metals.
  - High material compatibility (metals, plastics)
  - No effect on biological tissues.
- Electrically non-conducting.
- Low toxicity
- Zero ozone depletion potential (ODP)
- Zero global warming potential (GWP)
- Reasonable manufacturing cost

To date, no replacement agent has been found that satisfies all of the above requirements, although replacements have been found that match many of the above criteria. Each class of extinguishant has strengths and weaknesses, and agent selection must be based on the criteria listed above along with detailed knowledge of the specific project requirements.

A summary comparing the qualitative differences between the clean agent extinguishant classes relative to Halon 1301 is found in Table 3. As seen from the table, no agent satisfies all of the requirements of the ideal Halon replacement; however, it can be seen from the table that the HFCs, followed by the inert gas agents, provide the best overall combination of desired properties.

In line with the characteristics of the various clean agents, the clean agent marketplace is dominated by two agents: the HFC agent FM-200 followed by the inert gas agent Inergen. The Novec 1230 perfluoroketone agent differs from Halon 1301 and all other Halon 1301 replacements in three key aspects: chemical reactivity, effect on biological tissues and physical state. Unlike the HFC and inert gas clean agents, which are characterised by very low chemical reactivity, Novec 1230 is characterised by high chemical reactivity. The reaction of Novec 1230 with water produces HFC-227ea and Perfluoropropionic acid, a strong, corrosive organic acid. Due to its high reactivity, Novec 1230 is the only clean agent that is classified as a volatile organic compound (VOC).

Unlike the HFC and inert gas agents, Novec 1230 undergoes reaction in the lungs, to form HFC-227ea and Perfluoropropionic acid when it crosses the lung-air interface. In contrast, the HFC and inert gas agents do not react to form potentially hazardous products. The toxicity of FM-200 is so low that it is approved for use as a propellant in metered dose inhalers (MDIs), where it is employed to propel a medicament down the throat of the patient into his/her lungs.

Unlike the HFC and inert gas clean agents, which are all gaseous at room temperature, Novec 1230 is a high boiling liquid (bp = 48°C). This increases the possibility of a liquid discharge with Novec 1230 compared with the other clean agents and also affects its performance. For example, recent studies have indicated that Novec 1230 is ineffective in several civil aviation applications.

• Clean Agent Applications

Clean agents are employed in a myriad of applications, including pleasure boats, marine and military vessels, flight simulators, medical facilities, cellular sites, internet service provider (ISP) centres, TV and radio control rooms, microwave relay towers, anechoic rest chambers, clean rooms, flammable liquid storage areas, art galleries, libraries and museums. Worldwide, numerous high value items are protected by clean agent systems. FM-200 suppression systems protect the electrical systems of the Eiffel Tower, the first draft of the Declaration of Independence, and protected the Star Spangled Banner during its recent restoration. Inergen systems protect copies of the Gettysburg Address, copies of the Gutenberg Bible, and paintings by Picasso and Monet. FE-25 suppression systems protect the engine nacelles of the U.S. Navy F/A-18E/C and V-22 aircraft, and FE-13 systems are employed in inerting applications on the North Slope and McMurdo Station in Antarctica.

Clean Agents in the Future

With the expected future increase in the reliance of businesses on expensive, sensitive and mission-critical equipment such as computers and electronic equipment, the need for clean agent fire protection is also expected to experience vigorous growth. The HFC clean agents, followed by the inert gas agents have been proven to provide the best overall combination of the properties desired in a clean agent replacement for Halon 1301 and it is expected that these agents will continue to dominate the clean agent marketplace.

- **Future Regulation of Clean Agents in Fire Suppression Applications**

With regard to the regulation of any chemical, no one can guarantee a lack of future regulations, and speculation on this point serves only to confuse the industry and drive end users to non-clean alternatives such as sprinklers.

No one can guarantee that HFCs in fire suppression applications will never be phased out – not without being able to divine the future. Can anyone guarantee that perfluoroketones will not be phased out in the future? Unlike all other clean agents, perfluoroketones are characterised by high chemical reactivity (for example, hydrolysis when crossing the lung-air interface to form perfluoropropionic acid, cf. Novec 1230 Fire Protection Fluid Safety Assessment, 3M). Because of this effect of Novec 1230 on biological tissues, facility managers are expressing increasing concern over the ultimate safety in use of perfluoroketones in normally occupied areas.

Even the inert gases have been challenged by acoustic damage, high cylinder pressures, and room over-pressurisation. Regulations continually evolve as new science, information, and issues develop in the marketplace and no product is immune to a changing regulatory future.

No other issue related to clean agents is perhaps more misunderstood and misrepresented in the marketplace than the issue of the environmental impact of HFCs in fire suppression applications. Two oft-encountered examples of such misinformation are the assertions that the emissions of HFCs in fire suppression applications are rapidly growing, and that as a result, the impact of HFCs in fire suppression applications on climate change is rapidly increasing. Factual data available from third-party sources indicates otherwise. Table 4 provides a summary of US EPA estimates of the impact of HFCs in various applications on climate change from 2005 to 2010, the latest date for which data is currently available. As seen from Table 4, the contribution of HFCs in fire suppression applications to climate change has remained essentially constant over this period, despite growth of the HFC clean agent market. The contribution of HFCs in fire suppression

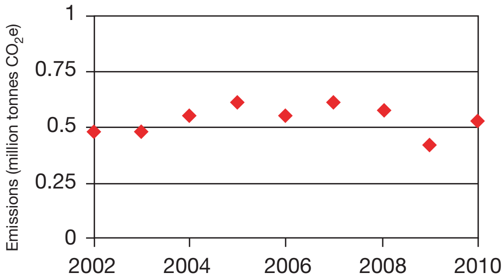
Unlike all other clean agents, perfluoroketones are characterised by high chemical reactivity (for example, hydrolysis when crossing the lung-air interface to form perfluoropropionic acid, cf. Novec 1230 Fire Protection Fluid Safety Assessment, 3M).

Table 4. Impact of Emissions of HFCs from Fire Suppression. Applications on Climate Change: Historical

	Tg of Carbon Dioxide Equivalents					
	2005	2006	2007	2008	2009	2010
Refrigeration/AC	87.9	90.1	90.3	90.4	91.3	97.6
Aerosol	7.3	7.7	8.2	8.6	9.1	9.3
Foam	1.9	2.1	2.3	2.5	3.9	5.4
Solvent	1.3	1.3	1.3	1.3	1.3	1.3
Fire Protection	0.5	0.6	0.7	0.7	0.8	0.9
Semiconductor manufacture	0.2	0.3	0.3	0.3	0.3	0.3
R-22 manufacture	15.8	13.8	17	13.6	5.4	8.1
Total HFCs	114.9	115.9	120.1	117.4	112.1	123.0
Total all GHGs	7204.3	7159.2	7252.8	7048.4	6608.3	6821.7
Contribution to climate change from HFCs in fire extinguishing applications	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%

Source: Inventory of US GHG Emissions & Sinks: 1990-2010 (US EPA, 4/15/2012))

Figure 1. Fire Extinguishing Emissions of HFCs: HFC Emissions Estimating Program (HEEP)



applications to climate change is minuscule, representing only 0.01 percent of the impact of all GHGs on climate change.

Estimates of emissions of HFCs from fire protection applications from the US EPA and EU-15 countries are consistent with the emission estimates from the HFC Emissions Estimating Program (HEEP); as seen in Figure 1, HEEP data also indicates that the emissions of HFCs from fire suppression application are not increasing but have remained essentially steady for the past decade.

It is a fact, that with regard to regulations, HFCs in fire suppression applications are being treated differently than HFCs employed in other applications. Emissions of HFCs from fire suppression applications are dwarfed by HFC emissions from other applications such as refrigeration. Regulatory bodies understand this, and to date HFCs in fire suppression applications have been subject to different sets of regulations. A good example is the F-Gas regulation in Europe, which has adopted, supported and regulated good industry practices around system filling, handling, and servicing of fire systems.

Conclusion

Clean agents are ideally suited for the protection of sensitive, expensive and mission-critical assets, and are employed to protect billions of dollars of assets worldwide.

With the demise of the Halons, extensive efforts have been undertaken in the past 25 years to develop "Son of Halon" involving the screening and evaluation of thousands of candidates. However, to date no replacement has been found that meets all of the criteria of the ideal Halon replacement. As a result, agent selection must be based on consideration of all the key criteria of a Halon 1301 replacement along with detailed knowledge of the specific project requirements.

The HFC clean agents, followed by the inert gas agents have proven to provide the best overall combination of the properties desired in a clean agent replacement for the Halons: high effectiveness, cleanliness, low chemical reactivity, low toxicity, minimal environmental impact, and competitive system cost. With the expected future reliance of businesses on expensive, sensitive and mission-critical equipment such as computers and electronic equipment, the need for clean agent fire protection is also expected to experience vigorous growth. IFP

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What Future for S International Fire

Standardisation and product approval is an important part of the fire industry. These products are provided for the protection of life and property and must be robust and secure in all situations. Typically there are three distinct requirements defining the fire alarm system in a building: regulations: Installation guidelines or codes of practice; and product standards.

There are however wide regional variations with different sets of regulations, installation guidelines and product standards and a further complication is that these different systems do not cover the requirements in exactly the same way.

For this article the markets are defined as USA, Europe and the international fire market (meaning those regions outside either the USA or Europe). The regulations that apply in each country normally include the building codes. For example, in the US, NFPA 101 Life Safety Code and other codes determine whether a fire alarm system is required in a given occupancy.

USA

In the US, NFPA 72, National Fire Alarm and Signalling Code, covers the application, installation, location, performance, inspection, testing, and maintenance of fire alarm systems. Products are designed and approved to the applicable UL product standards. For example, UL 864 covers control and indicating equipment (CIE) and power supply equipment (PSE).

Europe

In Europe each country has its own regulations defining the type of protection required for different types of building and building usage. However across the EU the EN 54 series of standards has been developed to define the performance requirements for products. For example, EN 54-2 and EN 54-4 cover CIE and PSE.

Due to the huge diversity of custom and practice across Europe it has been a struggle to get agreement on the installation code of practice (CoP). Currently national codes still apply in each country; for example, NF S61-970 in France, VDE 0833-2 in Germany and BS 5839-1 in the UK. These codes are strongly divergent even in basic requirements such as the spacing of devices, the requirements for detection coverage, methods of evacuation and equipment provided for the fire and rescue service.

However there are countries in Europe that do not have such highly developed codes and there is an urgent need for a unified code to be available to allow the development of provision of services across Europe. The solution to these problems rests with EN 54-14. Now in the final stages of development, this document is expected to provide the long awaited missing link.

There is still debate over how far CEN EN 54-14 is able to go and how best to achieve the required compromise. The current proposal is a framework EN Standard that delegates to national standards bodies the definition of local requirements on some issues, such as the spacing of detectors. But there are concerns that this may not meet the rules for writing CEN standards. There are also proposals suggesting compromise requirements that could be adopted to avoid the need for national intervention.

Currently national codes still apply in each European country. However, there are countries in Europe that do not have highly developed codes and there is an urgent need for a unified code to be available to allow the development of provision of services across Europe. The solution to these problems rests with EN 54-14. Now in the final stages of development, this document is expected to provide the long awaited missing link.

The document currently exists as a technical standard, TS 54-14. In this form it is an informative document that has no formal status outside CEN; it is not required to be adopted by European national standards bodies (as is the case with EN standards). Until recently TS documents had a limited life time of three years and were used as an interim development before a full EN standard was available. But at the beginning of 2012, CEN changed its rules allowing a three-year review and indefinite continuation of technical standards. So TS 54-14 could continue indefinitely in this status.

This is important because the prospect of a full

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tandards in the Alarm Market?

EN 54-14 would require the withdrawal of conflicting national standards. As previously mentioned, several countries have well established national CoPs and this would cause a major conflict with the CoPs in these regions. This would make it difficult for these countries to support and they are likely to oppose a document that would threaten continuity of service and well established custom and practice.

The rules of CEN voting are that the votes are weighted according to the population of the member countries. This means that the very countries that have strong fire CoPs are those with the largest weight in a CEN vote. Their influence means that EN 54-14 could fail and be rejected.

Again the most difficult challenge has been developing ISO 7240-14, Design, installation, commissioning and service of fire detection and fire alarm systems. Like its EN 54-14 counterpart, this document is in the final stages of development but is expected to be released by the end of the year.

Unfortunately in this case, the ISO 7240 standard has been independently developed because EN 54-14 is itself still in development. An important distinction of the current proposal for ISO 7240-14 is that the requirements are prescriptive and do not allow for variation of the extent of cover for the fire alarm system based on risk assessment of the application.

The big question in all this is which standards and codes of practice will become effective and dominant in satisfying international fire market requirements? The latter part of this year is proving to be an important turning point with two key documents reaching completion that will inform the safe and effective application of fire alarm products. It will then be up to the market to determine which of these alternative systems best fits its requirements.

This is a horrendously confusing and complex interplay of conflicting issues. What is the future? This will be decided in committee work later this year and we all wait to see what skill will be brought to solve the problem. The best solution might be that the existing draft is amended to include complete compromise requirements but that the document remains as TS 54-14. This will allow the support from all European nations and will provide useful common guideline standards to be adopted without change or further development by the countries that have the need. However countries with established strong CoPs will be able to adopt the standard at a pace that will allow the safe adaptation of local custom and practice.

International

For the international market, each region obviously has national regulations that apply, but the ISO 7240 series of product standards successfully defines international product requirements. By drawing on the experience and success of the European EN 54 series, the ISO Technical Committee 21 was able to quickly develop these standards coping with the large regional variation in custom and practice, the same problem solved in Europe with the EN 54 Standards. The ISO 7240 series is derived from and closely related to the EN 54 series.

Where will it End?

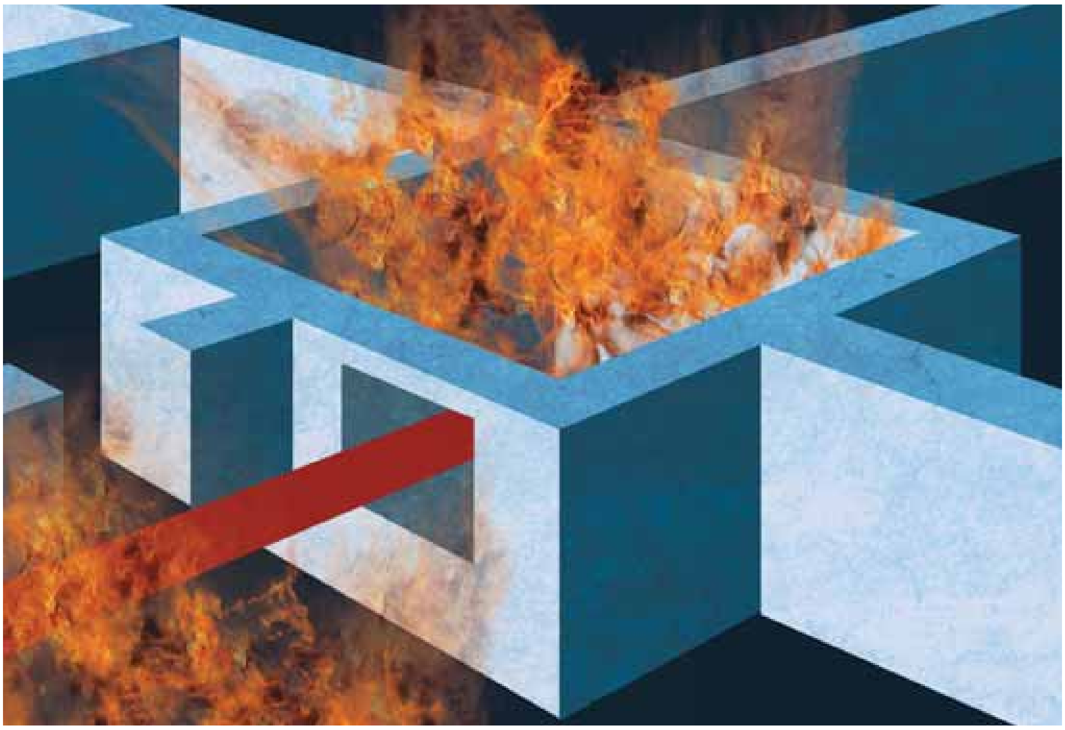
The big question in all this is which standards and codes of practice will become effective and dominant in satisfying international fire market requirements?

The NFPA 72 and UL Standards are already widely in use throughout these regions, as are the EN 54 standards, usually in association with one of the European national installation codes of practice. However, the ISO 7240 series is of increasing importance with countries such as Australia, New Zealand and Singapore adopting these standards into national standards. China, although currently using national codes, is actively participating in the ISO standardisation process. Obviously an attraction of the ISO standards is that regions are able to easily participate in standards development.

The latter part of this year is proving to be an important turning point with two key documents reaching completion that will inform the safe and effective application of fire alarm products. It will then be up to the market to determine which of these alternative systems best fits its requirements.

Who will win? Quite possibly the ISO 7240 series, although ideally with the inclusion of a more flexible extent of cover that takes account of risk assessment as described in ISO 16732-1. This will then provide safe but cost effective strategies of fire protection. IFP

Figure 1



Understanding the Basics of Firestopping

Christopher DeMarco

Specified Technologies Inc.

A building is made of a number of fire-rated compartments. When these compartments are breached by various building service elements such as pipes and conduits, their fire-rating and ability to resist smoke migration is compromised. Firestopping, thus, is the process of installing third-party tested and listed materials into openings in fire-rated barriers to restore fire-resistance ratings. Building and fire codes, such as NPFA, ICC and European standards require that such rating be restored through firestopping. This article focuses on through-penetration firestops. In the next edition of International Fire Protection the focus will switch to construction joints and more advanced topics. This will include perimeter fire barriers (curtain walls) and challenging conditions found in the modern building environment, such as low voltage cabling, that should be taken into account when selecting the best firestop product and system.

Firestopping is the process of installing third-party tested and listed materials into openings in fire-rated barriers to restore fire-resistance ratings. This is usually a simple process when thought of ahead of time, but can become painful and expensive if done after the fact. Avoiding it altogether will put any type of structure at risk, even if it is protected by a sprinkler system.

Elements of a Firestop System

A through-penetration occurs when a service element breaches a fire-rated barrier. In Figure 1, the red object represents a conduit penetrating a fire-rated compartment. If the opening around the conduit is unprotected the fire has a path to propagate quickly into the adjoining space. Figure 2 shows a properly installed firestop system that seals the opening around the conduit and restores the fire-rating of the barrier. Fire and smoke are now contained to the compartment of origin.

For many people the notion of firestopping means red caulk around conduits or cables. But what good is a great "caulk" if the barrier cannot withstand the fire? Therefore, a firestop system

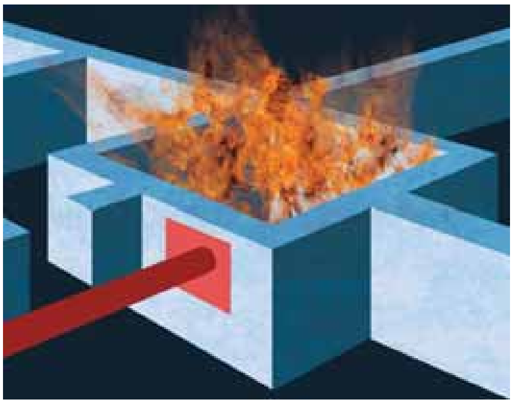


Figure 2

starts with the fire-rated barrier itself, whether a floor or a wall, then the opening and what goes through it. Finally comes the firestop product installed into the opening as described by an Underwriters Laboratories (UL) classified firestop system, a Factory Mutual (FM) approved design, or as tested to the European standard EN 1366. The complete assemblage of elements, which is called a system, achieves the rating, not an individual product.

Tests for Through-Penetration Firestops

For evaluation of through-penetration firestop systems, the base standard used is ASTM E 814, entitled *Standard Test Method for Fire Tests of Penetration Firestop Systems*. UL has a similar standard, UL 1479, entitled *Fire Tests of Through-Penetration Firestops*. In the United States, current building codes refer to both UL 1479 and ASTM E814. In Europe, the new standard is EN 1366, although individual countries may have their own legacy standards such as BS 476 in the UK or DIN 4102 in Germany.

UL 1479 exposes the test specimen to a standardised time-temperature curve, which ensures that all systems are tested to the same rigorous requirements in order to provide a benchmark. This curve is shown in Figure 3.

At five minutes, the furnace temperature is 538°C; at one hour it reaches 927°C. At two hours the temperature reaches 1010°C; at three hours it reaches 1052°C; and at four hours it reaches 1093°C. These are critically high temperatures, remembering that, aluminium cable conductors typically melt at 649°C and many plastics ignite at temperatures significantly below 538°C, that is within two or three minutes of the start of a fire!

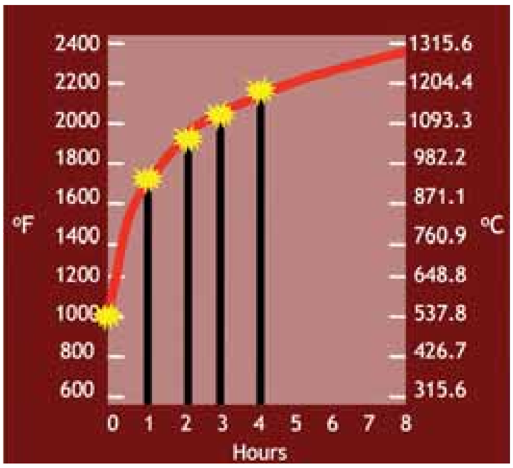


Figure 3

F & T Ratings

Successfully passing tests to UL 1479 provides firestop systems with an F rating and a T rating. The F rating indicates how long, in hours, a firestop system has successfully prevented the passage of a fire. A two-hour F rating means the firestop system prevented fire spread for two hours.

The T rating is a measure of the thermal conductivity of a firestop system. This is the time required for various points on the unexposed side of the test assembly to rise 163°C over the starting ambient temperature.

Figure 4 shows an example of a UL test assembly consisting of plastic pipes installed in a concrete floor and protected with firestop collars.

The assembly is anchored to the test furnace. During the testing process, the firestop collars will expand through a process called intumescence: heat applied to the firestop material causes it to expand rapidly. In so doing, they close-off the openings and prevent the fire from spreading. Intumescent products are common in the industry and are particularly well suited for combustible materials, and are also frequently used on non-combustible materials as well.

The hose stream test (Figure 5) immediately follows the fire test and is designed to evaluate the structural integrity of the assembly. This is by far the most difficult segment of the test to pass. The red-hot assembly is blasted with a stream of cold water from a 64mm diameter hose discharged at high pressure. Not only does the assembly need to withstand the force of the water pressure, it also needs to withstand the strong internal forces developed from the thermal shock of rapid cooling. UL 1479 prescribes the pressure and duration of the hose-stream exposure, which depends on the hourly rating being tested and the size of the assembly. Firefighters should particularly be aware of the hose stream test as it gives an indication of whether a structure will withstand the back-draft effect. The thermal shock and force of applying a cold, high-pressure stream of water to a red-hot assembly is a good measure of system integrity.

To pass the hose stream test, the firestop system must prevent the passage of water to the unexposed side. It is important to remember that a building fire is a dynamic event. As pressure levels change and heat becomes more intense, surrounding structures and elements can fail, thereby stressing the firestop. The thermal shock of applying a cold, high-pressure stream of water to a red-hot assembly is a good measure of system integrity.

Testing to European standards is somewhat similar to that of ASTM/UL although the derived ratings are termed differently. However, the European standards evaluate only fire exposure and do not include a hose stream. This explains why European firestop systems often use mineral wool boards coated with a firestop spray or sealant; an approach that is not acceptable under ASTM/UL as it cannot pass the hose stream test.

Figure 4

L and W Ratings
Unlike ASTM E814, EN 1366 or BS 476, the UL 1479 standard includes two test protocols (conducted at the option of the test sponsor) for evaluating air leakage (L Rating) and short term water resistance (W Rating). The L Rating is used as an indication of smoke resistance. This will be addressed in the second part of this article in the next edition of *International Fire Protection*.

FM Approvals
In some situations, particularly mechanical, electrical and plumbing (MEP) applications in industrial plants insured by FM Global, it is necessary to have FM approved firestop installations. This usually requires two types of documents: one showing that the manufacturer is subject to FM's quality inspection program, and one proving that the firestop system is tested under UL/ASTM standards.

When there is No Test
There will be situations when a manufacturer has no test for a specific application. In such a case, an engineering judgment (EJ) is permitted under strict conditions defined by the IFC (see below). The key to an EJ is that it must be issued by qualified personnel, usually a company engineer or a third-party engineering company, but never a sales person. It must also be based on credible testing. For example, issuing an EJ for a large plastic pipe based only on a test for small plastic pipe is not acceptable.

The UL Mark
Products tested at UL provide a very important piece of quality assurance through the presence of what is called the UL Mark. That is the guarantee that the composition of the product the manufacturer sells is the same as what was tested. This is achieved through a series of unannounced and continuous inspections conducted by UL throughout a manufacturer's productions facilities worldwide. Even the ISO certification does not provide such an independent assurance, and it is a requirement that the EN 1366 standard is trying to emulate.

Where to Go for Help
Firestopping is a specific and often misunderstood construction practice. Quality firestop manufacturers offer assistance to designers, inspectors and end users, usually free of charge and available by telephone, fax or e-mail. Many publish valuable information including firestop designs, product information and other informative articles online on their websites. Most manufacturers staff the telephone lines with degree-qualified engineers. In my company, these same people (some 15 of us around the world) have a hand in product development, from early concept to third-party testing. The ability to contact manufacturers' technical personnel directly represents a huge advantage to the end-user. Their wealth of knowledge can only assist in getting the job done efficiently and, most importantly, correctly. Serious manufacturers of firestopping products also have trained field personnel that can help on job sites and visit with users.

Additionally, organisations such as the International Firestop Council (www.firestop.org), a not-for-profit organisation of manufacturers, distributors and installers, services the construction industry by publishing valuable information and working with industry professionals to increase awareness of proper firestop practices. Similarly, the Firestop Contractors International Association (www.fcia.org) is an excellent source of information and contractors trained to the highest standard by being FM4991 approved or UL qualified.

Of course, when it comes to better understanding the specific code requirements of an individual construction project, always contact the local Authority Having Jurisdiction (AHJ). The code official has a clear understanding of building requirements and experience gained from a multitude of similar construction projects.

Summary
Firestop systems, not individual firestop products, achieve ratings based on evaluation to the appropriate standards described herein. A firestop system (and firestop product) is only as effective as the manner in which it is installed. A good installation will be consistent with the characteristics described in the firestop system. A well thought out selection of a firestop product will ensure the building's needs are maintained as the various service elements are changed or expanded. Unfortunately a firestop system can be rendered ineffective if installed (or reinstalled) improperly. Installation practices considered improper include inappropriate mixing of products, using materials other than those tested as part of a firestop system, not following the parameters of a firestop system, and of course penetrations that are not protected at all or where protection has been removed or reduced over time. Such a system has no integrity and presents a safety hazard rather than being an important component of a building's life-safety system. IFP

Figure 5

Christopher DeMarco is Manager of Technical Services and Applications Engineering at Specified Technologies Inc

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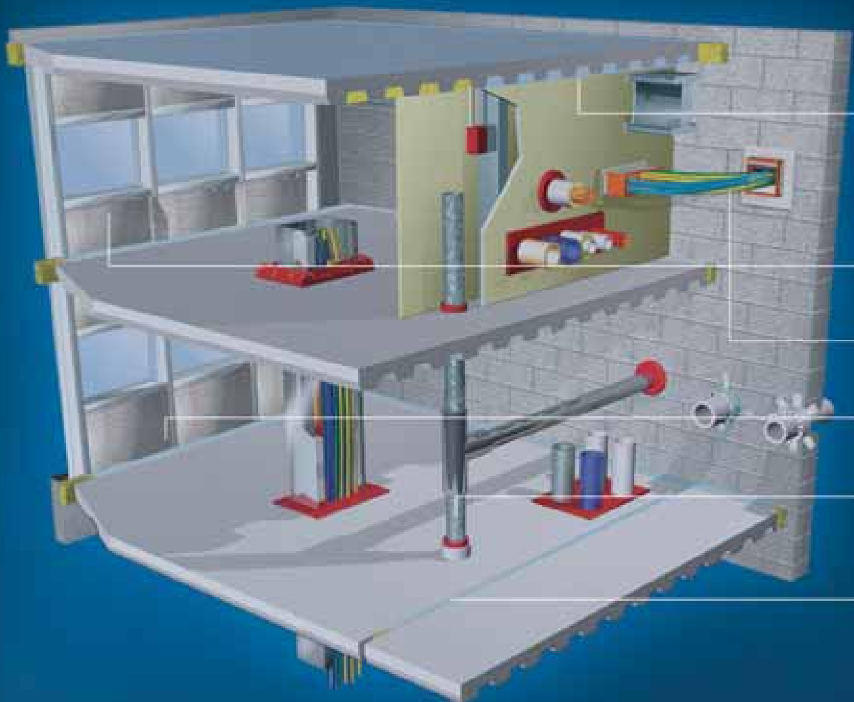

Protecting Petroc

An explosion near flammable products often causes containers to rupture and leak

Sean Appleton

Promat UK

Due to their hazardous nature, petrochemical and gas processing facilities have always been vulnerable to the danger of fire, and the huge potential social, political, financial and ecological impacts of a major disaster mean that safety concerns are always a prime consideration.

Because a blaze in a petrochemical or gas processing facility can create a very sudden rise in temperature levels, the potential for the fire to spread is considerable. The effects of this can be devastating, as demonstrated by a major blaze at the UK's Buncefield Oil Storage Terminal in 2005. The initial stage of the incident triggered a series of subsequent blasts that eventually engulfed 20 large storage tanks. The blasts were audible up to 200 kilometres away and the incident left 244 people requiring medical aid.

Other recent major fire and blast related incidents have included the 2005 BP refinery fire in Texas City, and the 2009 Cataño oil refinery fire. Both of these highlighted the crucial need for a robust evaluation of the risks involved, and the provision of effective fire and blast protection that can help limit the consequences of this type of disaster.

Hydrocarbon & Jet Fires

One of the most significant dangers faced by oil, petrochemical and gas facilities is the risk of a 'jet' or 'spray' fire. A jet fire usually involves a forceful flame, created by highly combustible fuel that is released in a particular direction as a result of a leak or other breach in the container that houses the fuel. This situation can create particularly intense levels of localised heat, plus exaggerated degrees of heat flux and turbulence, and it is far more capable of eroding fire protection measures, damaging structural steelwork and rupturing other vessels and pipe work than a non-hydrocarbon blaze.

The properties of a jet fire depend on many factors such as fuel composition rates and release conditions, and although considerable research has been done into these topics over recent years there are still many areas of uncertainty surrounding the subject. Although the dangers involved are easily understood, the process of heat transfer from the fire to the storage vessel is not. This is one of the reasons jet fires, and indeed hydrocarbon fires in general, are regarded as being difficult to control with active fire protection methods alone, as these are designed only to extinguish a blaze. This creates a real requirement for jet fires to be contained by the use of passive fire protec-

hemical Plants

tion measures, where the emphasis is on insulating a steel or concrete structure from the effects of fire and limiting any rise in temperature.

Structural Steel Protection

Petrochemical facilities often include major structural components made from steel – a material that is sometimes viewed as being less prone to the damaging effects of fire than other alternatives. Steel is seen as a rigid, strong and reliable material that will withstand whatever comes its way. Unfortunately this is not always the case. When exposed to temperature rises, steel can begin to lose its strength with alarming speed, particularly when under duress from hydrocarbon and jet fires. Passive fire protection measures slow the rate of heat transfer into the steel structure and significantly delay the time it takes to reach the point where structural failure occurs. This also allows more precious time to evacuate personnel and bring a fire under control, helping to limit the destructive effects of a major blaze.

Many hydrocarbon blazes result from an explosion in the vicinity of flammable products, which often causes containers to rupture and start leaking. Thus it follows that if it is to be effective, any type of passive fire protection must be able to withstand a degree of explosive force, so that it remains in place and provides on-going protection. Perhaps the most effective method of protecting steelwork in such high risk areas is the use of a spray-applied coating system.

Protective Coating

This type of integrated coating system can usually provide reliable protection against an initial blast and any subsequent blaze. This makes it ideal for use on various types of structures and vessels in oil, gas and petrochemical facilities. The performance of this type of solution has been proven in many hundreds of applications, and some systems have been independently tested and approved to internationally recognised test standards, such as UK (BS 476: Parts 20-21: 1987 Appendix D), plus International Standard ISO 834, and USA (ASTM E119, UL263 and UL1709 – Design No. XR719).

The better systems available offer a factory-controlled premix of vermiculite and Portland cement, which is mixed with potable water before application. This can be done by spray-application over a light, wire mesh framework, which produces a monolithic coating that can withstand the thermal shocks present in a high intensity hydrocarbon fire. It acts as a highly effective thermal barrier that slows down the heat transfer process, increasing the time it takes for the structural steel to reach its failure temperature. This, in turn, can delay or prevent the collapse of the whole structure, potentially saving lives in the process.

A coating of this type will not usually promote any corrosion of the steelwork to which it is applied. However, a primed substrate is often used to create long-term resistance to corrosion, particularly when the protected structure is to be left exposed to the elements.

In addition to providing robust protection to structural steelwork, this solution is also suitable for protecting concrete structures, as it helps prevent the process of explosive spalling. Triggered by sudden temperature rises, the process of spalling causes micro-cracks to appear in the concrete. These can result in the surface of the concrete breaking away, and will eventually lead to a significant loss of structural strength.

Major structural components can be surprisingly vulnerable to the effects of fire

Ideal for off-site application by either spray, roller or float finishing methods, this type of fire protection will not crack under mechanical impact, and furthermore, it also has a low density composition that reduces any dead load added to the structure being protected. Various thicknesses are required to achieve the desired level of protection for a range of different applications. However, any reputable system manufacturer will be able to provide accurate computer-based thickness calculations for specific fire resistance requirements.

The durability of fire protection can also be enhanced by the application of a top-coat surface coating that will protect against the ingress of salt spray, wash-down water, chemical spills, rainfall, sprinkler deluge systems and the subsequent freeze/thaw damage, ensuring that the fire protection layer below remains intact and able to deliver the maximum performance. Flexible, flame retardant and mould resistant, top coats will help reduce the carbonation rate of cement-based products and can also be used on masonry, brickwork or blockwork.

Protecting People & Equipment

This type of protection is ideal for structural and storage vessel applications. However, increasingly stringent health and safety requirements mean that vulnerable equipment and plant personnel also need the maximum level of protection, and this requires a different approach.

PETROCHEMICAL PROTECTION

A spray-applied, single package premix coating can be used to protect concrete in vulnerable locations

Composite steel panel systems can provide an ideal solution to this requirement, as they are lightweight, strong and resistant to fire, blast, impact and corrosion. These systems can be used as a building material to create fire screens, fire doors, ceilings, enclosures, ductwork and even escape routes, providing protection to process-critical systems and protecting the lives of employees. Integrated fire protection systems such as this have been thoroughly proven over many years on high-risk hydrocarbon applications, as well as numerous large rail, metro and airport projects. As a result, there is now a wide range of system specifications available to suit different applications.

Composite steel panels typically consist of two punched steel sheets that are mechanically bonded to either side of a non-combustible composite core of fibre-reinforced cement, capable of delivering up to 240 minutes of fire and blast protection. This type of system is often classed as 'non-combustible' to BS 476: Part 4:1970 and to Clause 10 of EN 13501-1:2002. Protective walls can be designed to provide high blast resistance and to meet most of the generally recognised fire curves, including hydrocarbon and cellulosic. Composite steel panel systems have been proven to withstand the most demanding and hostile environments, as well as extremes of temperature and high thermal shock levels.

The panels will retain their ability to perform even in the aftermath of a fire, thus making any subsequent rescue operations easier than they might otherwise have been. Impressive impact and moisture resistance are key characteristics of a composite panel system, along with the ability to withstand the effects of fire suppression and deluge systems. This type of versatility means that this method of protection can be used to create bespoke constructions, with walls and partitions built in layout and framing configurations designed to meet individual project requirements.

There is usually no requirement for additional foundation or construction work, which makes installation a relatively quick and easy process. Combined with their multi-functional role, this makes composite steel panels a very attractive protection option.

Protection in Action

A project to build the GL2-Z LNG natural gas project in Arzew, Algeria, was recently completed using a spray applied, single package premix system – in this case, Promat's Cafco Fendolite MII – as a primary part of the passive fire protection. Specialist contractors installed over 1,500 tons to protect steel structures and vessel skirts against fire. The specification was made on the basis of a number of significant factors, including the product's track record on this type of application, and the technical support available from the manufacturer.

A similar quantity of the same product was used to provide two-hour hydrocarbon pool and jet fire resistance for three phases of the Sangachal Terminal Expansion Project in Azerbaijan. The system was used on concrete support plinths in the area that receives high pressure crude oil from the offshore platforms. Here, it helps protect against the risk of explosive spalling of concrete and the consequent collateral damage to the surrounding pipe work. This project was funded by a consortium led by BP, which had a lead role in the technical specification process. BP recommended this particular solution after experiencing its performance during an incident at the Grangemouth Refinery in Scotland. Here, Cafco Fendolite MII had been applied to a pipe support structure that withstood a direct seven-hour jet fire. The protection remained in situ for the entire period, protecting the steel supports and preventing a huge fire that would have resulted in a significant asset loss. IFP

Sean Appleton is Marketing Manager Promat UK

For further information, go to www.promat.co.uk

Reducing the Costs of False Alarms

Richard Paine

Morley-IAS by Honeywell

Technology is key to helping reduce false alarms that the UK government estimates cost the country around £1 billion a year.

More than 337,000 false alarms were attended by the UK fire service in 2010/2011, according to the Department for Communities and Local Government (DCLG). The annual cost for the service to attend these alarms is estimated to be more than £1 billion. Understandably, the pressure to reduce significantly these false alarms, and the government's spending on them, is high.

On top of these significant costs there are the less obvious risks, such as the health and safety implications of driving on blue lights. And, most importantly, if a fire crew is attending a false alarm then they cannot also be attending genuine emergencies.

Reducing False Alarms

Fire and rescue services are taking drastic measures to cut the costs associated with attending these call outs. Some are reducing the number of engines sent while others have stopped mobilising altogether in response to automatic fire alarms. However, there are other ways to reduce false alarms and the costs they generate.

Technology and training, along with good system design, can help to reduce the frequency of false alarms. There are many reasons alarms go off accidentally. The alarm may be poorly installed or it could be the incorrect system for its purpose. The device could also be fitted at the wrong height or installed in the wrong place. Importantly, if there are issues with the alarm at installation, then unless these are addressed the false alarms will continue to happen.

There are many sources of advice available to those responsible for the fire alarm system. The fire service plays an important role but manufacturers and installers of fire safety equipment can also be a great source of information. This training and advice can go a long way in helping to reduce false alarms.

Appropriate Technology

The first thing on the agenda for any person responsible for certifying the safety of a building is ensuring that the correct fire alarm is installed. Research conducted by the Department for Communities and Local Government found that of the 16,400 dwelling fires last year, 37 percent occurred in places that lacked an alarm. A further 25 percent occurred in places where a fire alarm was present but non-operational.

While an efficient fire alarm is crucial for the safety of the people using the building, it will also reduce accidental and malicious set-offs. There are many things for an organisation to consider when it comes to installing the correct system. Quality design is crucial, as is proper installation and regular servicing. Many fire solutions analyse air quality and if there is a lot of dust in the area in which they are sited, they may become blocked. Without proper servicing and maintenance an issue like this could go unnoticed and create future problems.

Each system must have the appropriate detectors for the environment it is detecting. A heat-detecting system would be inappropriate for a kitchen environment as it would generally be much hotter than other areas of the building. If a heat-detection system was to be used in this kind of environment the chances are that the alarm would be set off unnecessarily and frequently.

New Developments

Malicious false alarms are another frustrating issue for the fire service. These are especially prominent in schools, where children have been known to set alarms off as a prank. Fire safety systems are constantly being updated to reduce this type of set-off. In some schools, traditional call points are being reduced. Instead, every teacher is given a key and only they can set off the alarm.

In some systems a delay has been introduced, allowing a fire safety officer to inspect the area that has been flagged as a potential problem, before the alarm rings and the building needs to be evacuated. This allows the fire safety officer to confirm whether or not there is need for the fire service to attend.

It is not only essential that quality-approved fire alarm systems are used but also that they are fitted by approved installers to carry out design, commissioning and maintenance of the system. Different types of product will give different results. All devices, whether multi-sensor, thermal or optical sensor, must be supported by a central fire alarm panel. Approved fire alarm installers will be able to distinguish what device is most appropriate for a particular purpose. Optical sensor products might seem like a better, cheaper option but it will not always be the most suitable. It might work in a fire situation but it could frequently be set off accidently.

Choosing the correct approved fire system and associated technology is something not to be taken lightly. In these times of austerity, efficiency savings are a priority but it is important to select carefully the correct technology and choice of partner that will be responsible for the design, installation and maintenance. Choosing the wrong combination can have serious consequences when considering the life safety requirement.

Legal Obligation

With an accredited, approved product and installer you are buying more than just the product; you are also acquiring expertise. With complex systems, different protocols and control panels can be a minefield if you do not know what you are doing.

The fire alarm that protects a building is a crucial piece of equipment in ensuring the safety of the people inside. No organisation can afford to take risks with this type of equipment and the evacuation processes in nursing homes, schools and hospitals, for example, is even more complex than traditional situations.

There are also legal issues involved. The fire safety officer must be able to prove that the equipment is fit for purpose through completing a risk assessment. One way of ensuring that the alarm is suitable is to make sure the products are accredited and that there are adequate records to back this up. Should something go wrong and they are unable to provide this information, they may be deemed responsible and could be prosecuted.

Small Investment, Big Benefits

New developments in fire safety systems are playing an important role in reducing the number of false alarms that not only count towards the cost of running a fire service but also disrupt everyday business and the occupants of a building. There are still plenty of factors for an organisation to consider in ensuring it installs the appropriate system for their needs. But by making a comparatively small investment in a system with features built in to stop, or at least delay, an alarm activating, there will be far greater benefits when it comes to the safety of our communities. IFP

Richard Paine is Product Manager UK & Ireland at Morley-IAS by Honeywell

For further information, go to www.morley-ias.co.uk

Neal Porter

E2S

Signalling in Hazardous Areas

The increasing use of signalling devices to enhance safety in the workplace is to be welcomed. It is particularly important in petrochemical and oil and gas plants where the potential for serious accidents is far greater than most industrial environments.

Hazardous areas are defined as areas where concentrations of flammable gases, vapours or dusts may occur, either constantly (Zones 0 and 20), under normal operating conditions (Zones 1 and 21) or unusually (Zones 2 and 22). A whole series of additional conditions relating to the temperature classification and the auto-ignition temperatures of the type of gas or dust to be found to ensure that any equipment will not initiate an explosion or fire. Products designed for hazardous locations have to meet ever-increasing standards and regulations. ATEX is the key requirement for Europe, while in North America, UL standards apply. In other parts of the world, particularly Australia, IECEx is gaining increasing acceptance. As well as these globally recognised standards, there are many local fire approvals that usually have to be met. Additional certification such as VNIIPO in Russia, BOMBA in Malaysia and CCCF in China will be required.

Hazardous area products fall into two categories. They either prevent an explosion by constraining the amount of energy entering the device (intrinsically safe) or have a sufficiently robust housing to contain an internal explosion (explosion proof). In most cases, they offer a robust, weatherproof device capable of operating reliably in the harsh environments in which they are often installed.

It is not the intention to discuss hazardous area standards in this article but to offer some practical guidance on the use of signalling devices and their applications in these locations.

Intrinsically Safe

Intrinsically safe (IS) products will have been designed for Zone 0 (gas) and Zone 20 (dust) and can therefore be used in Zones 1, 2, 21 and 22 as well. They generally use standard "industrial" enclosures and the protection comes from the electronics that is specially designed to limit the amount of energy to prevent an explosion. Together with a Zener barrier or galvanic isolator, they offer a very safe solution that is easy to install, but the limited amount of energy means that IS devices will only ever have lower performance than the same device installed in a safe area. Typically, sounders will have an output between 90dB and 105dB at one metre and beacons will use low power LED warning lights rather than ultra-bright Xenon strobes.

This limitation means that, while they can be used outdoors in a plant, the sounder outputs are not sufficiently loud to be audible above the background noise. Consequently, IS products are usually best installed indoors in storage facilities, pharmaceutical plants and control rooms and indoor fire alarm systems that cover hazardous areas.

Explosion Proof

Explosion proof products use standard electronics but are housed in rugged enclosures designed to contain any potential explosion that may occur inside. This means they are heavier and more difficult to install than their IS equivalents but they can have significantly higher outputs. For example, alarm sounders can be up to 120dB at one metre and beacons can incorporate powerful xenon strobes giving an effective light output up to 500cd.

As an example, an LED intrinsically safe beacon may only warn people within a few metres of their location, but a 21 Joule explosion proof Xenon beacon has an effective warning distance of up to 35 metres. More importantly, the high intensity flash will reflect off any surfaces and will get attention even if one is not looking directly at it, an especially important consideration in a plant environment where maintenance personal will be concentrating on their work and need to know if there is an emergency.

These products are the mainstay of fire alarm, gas detection and PA systems on large petrochemical installations around the globe where gas is the primary hazard. Increasingly, warning devices are being installed in sugar processing plants, grain storage facilities and other areas where dust, rather than gas, is the main explosive hazard. Obviously, any equipment installed in such areas must be certified for use in Zone 20, 21 or 22 areas.

Increased Safety

Many locations are classified as Zone 2 and it is possible to install alarm devices that have been designed specifically for these areas. This means that high performance products that are easier to install and have a lower purchase cost can be specified. Surprisingly, while there is a strong cost-benefit case to be made for this kind of product, the vast majority of Zone 2 areas are populated by Zone 1 products; it seems that designers adopt a cautious approach when specifying.

Choosing an Effective Alarm

- **Beacons & Status Lights**

There are a number of different ways that can be used to generate light and for emergency signalling: it is important to know the advantages and disadvantages of each type to make the right choice.

Rotating mirror beacons are by far the most effective, and are still used extensively today, particular for vehicles and moving machinery. Their high output light reflects off everything but the use of halogen lamps (around 200 hours of working life) and a mechanical drive system mean they need regular maintenance and are generally not suited to hazardous areas, especially where maintenance rules requires the system to be powered down each time work needs doing.

Xenon strobes, particularly the higher power versions, have a working life beyond 2,000 hours and create an effect almost as good as the rotating mirror beacons, which means they are the preferred choice for critical alarm systems such as fire, gas and PA.

There is a lot of interest in LED technology at the moment and the benefits of long life and the low maintenance and life costs they bring. Even the brightest units fall well below the outputs of a xenon strobe and so they are best used as status lights. They are particularly beneficial when used as “system good” green indicators, which are often working 24/7. The steady light, low power consumption and long working life are real benefits.

- **Alarm Sounders**

These form the backbone of most alarm systems, and many countries have national alert tones for fire alarm that are a legal requirement. France for example has the AFNOR tone, Germany the DIN tone and there are the PFEER tones for the offshore industry.

The choice of tone is very important. Continuous tones can very quickly blend into the background noise of motors, compressors and steam and do not grab attention in the way a changing frequency tone does. The German DIN tone, which is also one of the PFEER tones, is particularly effective. It sweeps from 1200Hz down to 500Hz every second and can be heard at far greater distances than many other tones.

Electronic sounders can often generate up to 45 alarm tones, and many devices allow the use of three or four different stages of alarm, meaning that there can be a fire, toxic gas or any other kind of alarm from a single device. This allows greater functionality from each device and saves money on cabling and installation.

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Typically, hazardous area alarm sounders have outputs of between 110 and 120dB at one metre. To create effective warning, the sound level needs to be at least 5dB above the background noise and together with a choice of suitable tones, an effective alarm is created.

When using several different signals for different alarms, it is important that the two or three tones selected are different and can readily be distinguished by plant personal as a quick response in an emergency is vital.

As well as electronic alarm tones, there are the traditional electro-mechanical products such as bells, buzzers and sirens. These devices are rich in harmonic content, very effective and easily recognisable, but they suffer from the reliability of their mechanical mechanisms. Fortunately, digital electronics can now replicate these tones, often with outputs that are higher than the originals and with the reliability of electronics. Most importantly, they are available in both heavy duty weatherproof and Ex versions.

• Disaster Sirens

It is becoming more and more common for large industrial sites to extend their warning systems to cover car parks and storage facilities to provide a disaster siren for major emergencies and toxic gas release. This can be to warn both people on-site and also people living and working in the neighbouring areas adjacent to the plant. Sometimes the requirements are for a short distance (200 to 400 metres) and for others it is for far greater distances, possibly up to two kilometres or more.

Typical solutions now have battery back-up, silent test and options for various communication methods including TCP/IP, radio control, GSM and RS485 that mean a siren can be installed and managed remotely from the control room without significant expense.

Disaster sirens require high power inputs for operation, and so they are usually installed in the safe areas. However, it is possible to have the electronics installed in an Ex d enclosure and mount the speakers at 15metres, which is usually classed as safe area, giving the best of both worlds.

High quality voice reproduction can also be achieved using these products, giving the option of extending the site PA systems to cover other areas.

• Temporary Alarms

As well as the usual requirements for fixed safety warning devices on an established plant, there is increasing use as temporary alarms, especially during the construction phase of a new or extended plant. Radio control makes this an easy to implement solution, and with only a small AC power supply required or powered from solar panels, it can be up and running quickly and then moved to another site once the construction phase is complete.

This gives the construction engineers the option of a full fire alarm and/or emergency management system that can be activated from almost anywhere in the plant without any cabling, providing a temporary solution that is as effective as a fixed installation.

For the Future

Over the past few years, there has been increasing interest in SIL 2 rated products. While signalling devices do not need to certified in this way (it is a system design issue more than anything), it seems increasingly likely that manufacturers will begin to develop products that can be declared complaint, making the system designer's job easier.

Combined with the possibility of a fault-monitored product, this could give the market products that give plant managers information that all their key safety devices are working properly; a big step forward in improving safety in the workplace. IFP

Neal Porter is Sales and Marketing Director at E2S

For further information, go to www.e2s.com

Crisis Management Response

Bernhard Voit

Siemens Building Technologies

Crisis management and developing the processes and systems with which to handle it are crucial elements in any robust disaster recovery program.

There are essentially four considerations in emergency preparedness – prevent, detect, respond and recover. In terms of crisis management, the focus is primarily on response and recover, since the first two stages have already largely passed if an incident has happened.

Assuming that a crisis situation has been confirmed, the key considerations are therefore the means by which it is managed and then the capacity to return to normal operations as quickly and as efficiently as possible. In any critical situation the human response is obviously a vital factor. By using technology, certain elements of the process can be automated so that this human element is guided by systems indicating the predefined response actions for a specific situation, based on information provided from a variety of sources to optimise situational awareness.

In a crisis it is essential to coordinate a mass of information from the various people, organisations and response forces involved in order to ensure clear, concise and structured procedures to follow. Once the crisis is resolved, this information and the way in which the decision flow was handled can be used in analysing the event and learning lessons from it, as well as providing audited documentation that can be submitted in a court of law if needed. It is this move towards an 'intelligent response' to emergencies that is the driver in ensuring life safety, as well as minimising damage and the often considerable consequential disruption and costs associated with major incidents.

Threats to safety and security in the modern world are many and varied, with risks growing as a consequence of people living and working together in increasingly dense urban environments. Attacks and incidents throughout the world and the resulting high profile media attention that ensues have made us more aware that any contingency planning should involve the implementation of a response plan that is as all-embracing as possible to cover a range of eventualities.

However, although it is the major events that grab the headlines, it is important to appreciate that the vast majority of significant incidents derive from small origins: a short-circuit fault ultimately leading to a fire or an explosion in a power plant being a suitable example. This was illustrated by a nuclear power plant where a fire in a transformer ultimately resulted in the closure of the plant for over a year because the guidelines for such an incident were not followed.

Matching Protection to Risk

Different industries and processes obviously need different levels of protection, often depending on their role within the critical infrastructure and the importance of maintaining business continuity.

In a chemical or pharmaceutical environment, for example, there are stringent regulations regarding safety and security, while the fundamental role that data centres now play in so

t: an Intelligent

many operations means that regulatory authorities require evidence that the specific safety of products and the security of critical data are not at risk in the event of a failure or breakdown. Response plans in these and other industries are a requirement of the operating license, providing the means to prove process compliance. However, even when they are not driven by regulation, robust response procedures play a fundamental role in business continuity planning in many applications.

There are the inherent risks in particular industries to consider, such as a chemical spill, as well as the threats posed during high profile events such as the Olympic Games – security costs for the 2012 games in London are estimated at £600 million. While little can realistically be done to eradicate extreme natural disasters or to prevent terrorist attacks altogether, attention should be paid to eliminating public and industrial incidents as far as possible, as well as to implementing systems that detect the very first signs of combustion, intrusion, attacks or other hazardous events.

There is a fundamental need to be prepared to react and to have plans in place to protect and direct as many people as possible to safety in any emergency situation, big or small. Life safety is obviously the primary consideration in terms of both employees and the wider community but it is also important for a business to protect its reputation and to avoid any potential litigation costs. Reputation is increasingly business critical, with damage to it usually resulting in severe financial consequences, sometimes to the point from which a business cannot recover.

It is not enough just to develop and implement these systems. On-going maintenance and testing are also basic requirements; by detecting and addressing a failure early, a potentially major incident can be averted.

A dedicated servicing schedule is important in many applications, particularly those that are part of the critical infrastructure. Often the physical process of maintaining a site is supplemented and assisted through technology. For example, by combining video cameras with detectors, proactive surveillance of critical components can be conducted, supporting remote maintenance and providing alarms and verification of alarms for cost-effective monitoring and speed of intervention. By adopting this approach, it provides the means to keep the consequences of any incident to a minimum in terms of injury, fatality or damage, and also with regard to short-term and long-term commercial disruption.

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Back to Business

Focusing on the recovery phase of emergency preparedness, once the incident itself is under control it is about returning to business. This is inevitably tied in with the response phase; how quickly and how effectively a return can be made to normal operations is directly affected by how efficiently the incident itself is dealt with.

In a major incident, this could be a lengthy and complex process, including re-building the facilities that have been destroyed, restarting production, or cleaning any chemical contamination. When a site recovers from an incident the security, fire and automation systems need to be restored to ensure the safety parameters of the environment are in place to support operations. Learning from the incident is also important, with the recovery phase providing important lessons that can ultimately even improve operational efficiency.

Command and control is central to the response and recovery phases of an incident, as well as offering benefits in terms of improved

operational efficiencies in day-to-day operations. An example is a large university in the United States that has installed a system that has reduced the checks required for its sites' fire safety measures from two weeks to two hours.

Redundant Command and Control Centres

For critical infrastructures such as airports or multi-site enterprises with chemical production plants, a redundant setup for safety and security command and control centres offers significant benefits for day-to-day operations, but is even more important for disaster response and recovery.

During regular operations in a chemical plant, the local control centre is manned during daytime, while during night-time the command and control centre at headquarters takes over. In response to a disaster at the main plant that affects the command and control centre there, one of the decentralised control centres would be introduced as a backup.

In key infrastructures such as airports, backup control centres are essential to continue operations and services if the primary command and control centre must be shut down or is damaged. In this case the backup command and control centre gets manned and operations continue. An alternative approach is possible when there are separate command and control centres for security and fire brigade. In regular operations these two control centres run independently, while in an emergency each control centre can take over full operations from the other. Redundant integrations to subsystems or communication systems and consistency of data are a pre-requisite for these options.

The essential difference between command and control and conventional alarm management or danger management systems is that, in addition to displaying alarms and status information, command and control includes the management and control of first responders or similar resources.

In key infrastructures such as airports, backup control centres are essential to continue operations and services if the primary command and control centre must be shut down or is damaged. In this case the backup command and control centre gets manned and operations continue.

Employing systems based on open interfaces and integration enables interaction with various sub-systems such as fire alarms, emergency call systems, access control, video surveillance, and telephone and radio communication. These sub-systems can be run independently from each other or as inter-related systems. By consolidating into a single platform, security personnel and the emergency services responding to an incident are provided with an enhanced situational awareness, streamlined operations, and faster response coordination.

Computer-aided dispatch and integrated communication with those responders ensures the most effective deployment of resources and saves vital seconds. This means that any escalation or de-escalation of an incident can be responded to effectively, until the response phase is over. The open protocols employed also allow mass notification systems to be integrated, which increasingly are being used to guide those caught up in an incident to a place of safety out of the danger zone.

Returning to the issue of the human factor in any emergency situation, software-based command and control solutions can also offer significant advantages. They guide the personnel who need to respond to an incident as to what actions to take. This is a vital contribution in what is invariably a stressful situation, reducing the potential for human error. These pre-defined processes take the guesswork or expensive paper reference books out of the response, shortening reaction times and automating several steps in the disaster control process. This assists both internal and external resources. A major incident could involve many and varied personnel in the response, from firefighters and security officers to medical staff and engineers. All of this enhanced capability to respond to an incident ultimately ensures a much quicker recovery time.

Intelligent Response Shows the Way Ahead

With the increasing recognition that people's safety is more at risk today because of a seemingly greater number of violent incidents and attacks, there is a perceptible change of emphasis in safety and security priorities.

Fire and security systems are being increasingly integrated to provide a real response capability to any number of different situations. Integration and convergence of technologies will certainly remain a major focus and identifying ways of utilising even more of the data that modern systems can provide is a very definite trend. The more diverse and complex the risks and the environment, the more important it is to have a scalable and flexible management solution for alarm handling and response that can manage all aspects of safety and security.

Efficiency gains can be obtained in the field of incident response. It is already increasingly common for fire detection systems to be integrated with voice alarm and mass notification systems, automated extinguishing, emergency lighting, and building management and security systems. But the response systems now being developed – where the system in place involves a variety of these fully integrated, multimodal technologies – are taking this integration further. In the same way as today you can implement demand-controlled ventilation or heating in a building to improve comfort and energy efficiency, future technologies should enable a "demand-controlled" response to incidents, where systems would be able to analyse all relevant data that has been collected from the thousands of sensors and field devices and the various management systems from buildings throughout the site. They will then trigger the relevant response actions to guide people quickly and efficiently to a place of safety.

Response and recovery are inextricably linked. A more efficient response will inevitably reduce the impact of an incident and the time taken to recover. By adopting the software-based approach, it can assist in the thought processes required to establish robust and comprehensive operational procedures tailored to the specific requirements of an organisation. The post-event analysis and reporting mechanisms that integrated systems offer also speed up the recovery process. They enable the lessons learned from incidents to be converted into continuous improvements in emergency measures and policies, as well as identifying ways of upgrading the systems to further improve prevention, detection, response and recovery. The correct documentation of the response actions taken also proves that the response was carried out according to predefined and approved policies.

Reducing Complexity

The on-going move of safety and security systems onto the IT networks and the increasing use of open protocols mean that ways of enhancing integration across different systems are constantly advancing. The wealth of data available from these systems may suggest it is a more complex approach. However, the software being employed in the integration process is actually reducing the complexity in terms of response, providing the opportunity for all data to be routed through a single platform and translating it into procedures, protocols and actions for security and safety personnel to take.

This step-by-step approach guides the user, based on real-time situational awareness, enabling fast and effective decision-making both in emergency situations and in managing daily routine operations. Indeed, let it not bet forgotten that it is often the routine operations that can prevent relatively minor issues leading to a much more serious incident. If that serious incident does arise, quicker mobilisation mitigates the threat to life and to property, ultimately reducing disruption to operations and allowing a swifter recovery. IFP

Bernhard Voit is Head of Portfolio Command and Control at Siemens Building Technologies

For further information, go to www.siemens.com/infrastructure-cities or www.siemens.com/buildingtechnologies

Picture courtesy of The Performance Timber Products Group

Certificated Fire Doorsets Save Lives and Property

Roy Wakeman

The Performance Timber Products Group

Engineered fire-certificated timber doorsets, manufactured to industry recognised third-party accreditation schemes, provide precious life-saving opportunity for safe evacuation while additional time is gained for the control of the spread of fire in a building.

The development of modern building methods and the revolution in product design have been meteoric over recent decades and are influential in the specification and installation of products, materials and systems that provide ultimate levels of protection. This is important in the progress made by the passive fire protection industry in developing products and materials that lie dormant in buildings and are only required to work in the event of fire.

Completion costs for today's buildings have in real terms reduced over this period and final installation costs for most building components and products have become increasingly more competitive. This is supported by the reality of year-on-year inflation in the price of raw materials counterbalanced with the improved yield and productivity of today's manufacturing processes. An engineered fire doorset – complete with door leaf, frame and all ironmongery – is a real example with the average selling price of the installed assembly being less today than it was in 2005. At that time a leading firm of quantity surveyors illustrated how the final installed cost of a factory assembled doorset would save over 25 percent of the traditional method of procurement, which is still in evidence today.

Building Regulations and building control impose strict rules for compliance in accordance with the very latest industry-recognised certification

Picture courtesy of The Performance Timber Products Group

be protected by 30-minute fire resistant walls, ceilings and fire doorsets; this protection period providing vital time for occupant rescue.

All the components that make up a fire doorset are tested and approved under the same certification and backed by the BWF-Certifire Fire Doorset Accreditation Scheme, one of the industry's leading-third party schemes. It ensures products sourced and provided to the property owner, correctly installed, will protect property and more importantly, save lives.

Products that are not sourced responsibly propose a significant risk factor and it is alarming that even in today's rigorous environment that the vast majority of fire door installations are made by contractors buying all the components separately and constructing the assembly on the building site. Even in these circumstances, particularly where intumescent protected metal components or glazing retention is a requirement of the certification, and to make absolutely sure of a safe and sound specification, the risk factor can only be overcome by installing a complete fire door assembly that has been fully accredited.

In the case of the BWF, a completed fire doorset carries a prominently displayed tamper-proof label. The label identifies the period of time that the product will perform for and relevant information about the manufacturer. An identification number provides the manufacturing source and date of production. This is key to the operating life of the building, which must be maintained in accordance with the lifetime performance of the doorset. Normally the life for the products between tests is five years. Buildings undergoing refurbishment procedures in which the works may interfere with the performance of the product can be identified through the BWF-Certifire scheme.

Such schemes and regulations force less scrupulous manufacturers to improve standards and the higher degree of labelling and traceability provide a more demanding test regime and more reliable fire door solution. The BWF-Certifire Scheme is recognised by many regulatory authorities worldwide as an international mark of fire safety.

The history of the fire door has seen many changes and products were once provided made to the British Standard 459: Part 3: 1951. This was a prescriptive standard and doors made to this specification were deemed to perform for the period of time that was given in accordance with the construction. BS 459: Part 3: 1951 prescribed only two types of door that would fulfil the fire-check requirements. An amendment was made in 1959 that allowed other types of doors in their frames, however constructed, to demonstrate their level of fire performance by testing in accordance with the BS 476: Part 1: 1953.

This standard was replaced in 1972 with British Standard 476: Part 8 and a more onerous fire test was introduced that required an assessment of performance to specific criteria – stability, defor-

and performance standards with products and systems that are tested and proven by third-party bodies to protect life and property. Historically in the UK, these have been to British Standards that are now embraced by European equivalents.

The role of the fire doorset is to prevent fire from spreading from its source to other parts of the building by effectively closing off the room, or compartment, in which the fire started. Members of the British Woodworking Federation (BWF) introduced the Fire Doorset Accreditation Scheme (BWF-Certifire) which offers independently accredited timber fire doorsets of 30, 60, 90 and 120 minutes.

In the early days, plugs that were recessed into the side edge of the door on the hanging side were agreed with building regulators. These were colour coded to denote the time for which the product would resist a fire; 30 minutes is the most frequent requirement. In the British Woodworking Federation scheme the plugs were replaced with a tamper proof label when counterfeit plugs were found on the Chinese market.

As the performance of the fire doorset was exposed in the 1960s and 1970s through adverse fire experiences, the need to identify the product as a fire door became vital. This was mainly to prevent fraudulently calling a non-rated door a fully rated door. At that time, trading standards were randomly testing fire doors that had been installed and some were found to be 'wanting'. Regulation became necessary with the introduction of third-party accreditation schemes and Building Regulations were amended to make reference to them.

In the simulated fire test conducted by BWF-Certifire members, the doorset is in a closed position contained by the doors closers. The hot gases from the fire source cause the intumescent materials between the door leaf and the frame to expand rapidly and close the gaps between the components. This lasts for the period of the specified fire-rated door up to two hours. In extreme installations, where very expensive plant is to be protected, the fire rating designation can be even higher.

In domestic housing, where 50 percent of all fires start in the kitchen, this compartment could

mation of the test specimen, integrity, the test specimen's ability to resist the passage of flame or hot gases, and insulation, the ability of the test specimen to resist an increase in temperature of its unexposed face. Positive air pressure was introduced into the furnace and this required new methods of hanging the door to a frame and for sealing the gap between the door leaf and frame. Intumescent materials developed by the big chemical companies soon found their way onto the market.

At the same time there came the introduction of metric measurement that further complicated the market as the new recommended metric dimensional coordinated sizes in buildings determined a 40mm thick door leaf for internal use, whereas for fire protection, a 44mm thick door leaf, as prescribed by British Standard 459: Part 3, was more often required. This anomaly exists today.

In 1977 a draft European Directive was published relating to the classification, by testing, of the resistance to fire of structural building components, and in 1981 a comparison was made between the British Standard, this European Standard, and other international standards and was published as PD 6496. In 1987 BS 476: Part 8 was re-published in four parts as BS 476: Parts 20 to 23 adopting parts of the international standards and making improvements in some cases. BS 476: Part 22: 1987 remains as the key British Standard for testing fire door assemblies and doorsets today but in 2000 the European Standard EN 1634-1 was published. In 2002 the English and Welsh Building Regulations accepted both tests as alternative routes to showing compliance.

In Europe all member states have to recognise and comply with the Construction Products Regulation and for products where a harmonised product standard is in place and approved CE marking will become mandatory from July 2013. Currently fire resistance tests can be carried out to either the European Standard EN 1634-1:2008 or the British Standard 476: Part 22: 1987 but CE marking will only be possible for doorsets that have been tested to the European Standard.

During the testing process doorsets are built into a prepared opening in the furnace wall. Sometimes doorsets and the wall partition can be tested as a complete building component. Thermocouples are fixed to the non-fire face to measure the effect of radiation during the test, and others are used to control the temperature of the furnace fixed to an agreed time temperature curve; the top mean temperature reaches some 900 degrees centigrade.

Furnaces are usually fuelled by gas but sometimes oil is used as a fuel. During the test measurements are taken regularly from the thermocouples and at various times a cotton wool pad is offered close to the gap between the door leaf and frame in the top corner (the weakest point). If this ignites then the test is deemed to be a failure. Provided the specimen stays in its place and that no hot air, gasses or flames appear on the non-fire side for the duration of the target test time and a pass is achieved.

While in Europe, all member states have agreed a standard test method and all furnaces operate to this standard, each test centre has its own methods and operations for the way the test

Picture courtesy of The Performance Timber Products Group

results are interpreted and applied. This is close to being a lottery as sometimes an application of a result made in the UK could not be accepted elsewhere in Europe and vice versa. For this reason, extended application standards have been produced to complement the test standards and to enable uniform interpretation of testing outcomes.

There are many successful fire prevention schemes in the UK that are being installed at great cost to the property owner in which responsible landlords are playing a significant role in the protection of their tenants. South Essex Homes, for example, in Southend, Essex, has recently completed the first stage of a £3m fire safety project which has been carried out in a 10-storey tower block. Tenants are benefiting from education on the role they can play in preventing fires and the installation of new fire prevention features.

Here new communal doors with 60-minute fire resistance, fire resistant paint and automatic bin room sprinklers, as well as new fire resistant entrance doors to the individual flats have been installed. A figure in the region of £300,000 has been invested on upgrading the tower block.

Of course, not all stories have such a successful outcome. A landlord in the west of England has been found guilty of fire safety breaches following a fire where his tenants were forced to flee for their lives. The four-storey building had been subdivided into flats and the fire, which started on the ground floor, spread throughout the property and forced some of the 13 tenants to make their escape by clambering over the roof. In the following investigation it was found that the door giving entrance to the ground floor was inappropriately constructed to resist fire which enabled the fire in the flat to spread into the escape route. This offence carried a fine of £75,000 with three additional offences each carrying a fine of £20,000. IFP

Roy Wakeman is Chairman of The Performance Timber Products Group

For further information, go to www.ptp-group.co.uk

Leanne Danby

Cooper Fulleon

Are you ready for BS EN54-23?

Normal hearing is taken for granted by most of us, but there are estimated to be nearly nine million people who are deaf or hard of hearing in the UK alone, equivalent to one person in every seven.

For the deaf or hard of hearing, reliance on audible alarms in the event of a fire is ineffective. In addition, increased concerns over health and safety are encouraging the greater use of ear defenders in the work place and so there is a sizeable contingent of people who work in environments where alarm sounders are unlikely to be heard.

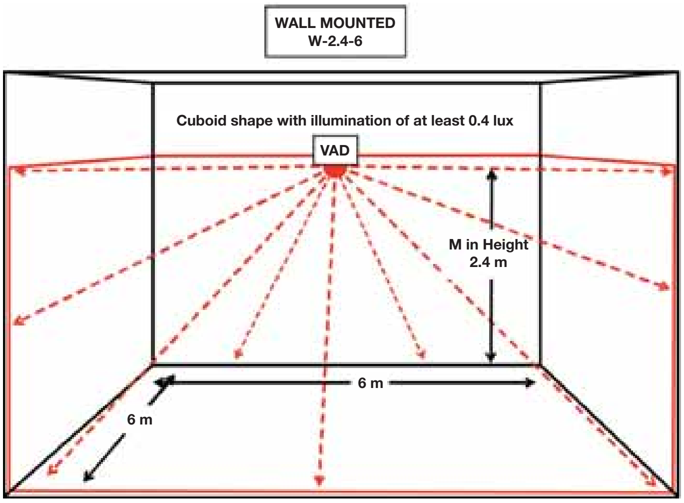
To overcome these issues, signalling needs to be broadened to stimulate senses other than hearing. Supplementing audible alarms with visual alarm devices (VADs) is an effective way to warn people in or around a building of the occurrence of a fire emergency so they can take appropriate action. Over recent years, the installation of VADs has experienced considerable growth and this trend continues due to the influence of the equality legislation and their suitability for various applications including staff-restricted warning systems, (such as nursing homes and public assembly buildings), broadcast studios and hospital operating theatres.

Current UK building regulations and BS 8300, *Design of buildings and their approaches to meet the needs of disabled people,* recommends that a VAD is sited in any area where a deaf or hard of hearing person may be left alone, for example, toilets or bedrooms. This, alongside the rising awareness of equality legislation highlights the increasing importance of the industry being vigilant in designing fire systems with the deaf and hard of hearing in mind.

BS EN54-23

Up until May 2010, there was no fire industry standard in the UK that determined the light output performance criteria and installation requirements of visual alarm devices. This gave rise to manufacturers specifying the performance of their products in an inconsistent, confusing and often misleading way. The use of Joules, Watts and Candela to specify a VADs performance are all largely meaningless, as they do not take into account the effectiveness of the light signal over a given area. Now this has been rectified with the release of standard BS EN54-23: *Fire alarm devices – Visual alarm devices.*

BS EN54-23 specifies the requirements, test



methods and performance criteria for VADs in fire detection and fire alarm systems. Manufacturers must now present the products performance data in a uniform manner so they can be directly compared and their suitability assessed for particular applications. All VADs sold for fire use in EU countries must be manufactured and certified to these requirements by 1st March 2013. For countries such as the UK, which do not currently require CE marking to the CPD, compliance will be enforced from July 1st 2013 when the Construction Products Directive (CPD) is replaced by the Construction Products Regulation (CPR).

The Fire Industry Association (FIA) and the Loss Prevention Certification Board (LPCB) have jointly published *COP0001 Code of Practice for Visual Alarm Devices used for Fire Warning*, which directly compliments BS EN54-23 and BS 5839-1. It provides guidance and recommendations on the planning, design, installation, commissioning and maintenance of VADs in and around buildings, other than single-family dwellings.

Coverage Volume

VADs will now be classified into three categories based on their intended application, namely ceiling-mounted devices, wall-mounted devices and an open class category. Each of these categories has specific targets for light distribution patterns in order to be compliant with EN54-23. Manufacturers should now ensure products are tested and assessed by an EU notified body to determine its coverage volume, based on the distance at which the required illumination of 0.4 lux or 0.4lm/m^2 is met. The manufacturer must specify the coverage volume with the device; either on the product or with supporting documentation. Therefore, specifiers should always look for the coverage volume specification code. Note – the flash rate of a VAD should be between 0.5Hz and 2Hz and should emit either a red or white flash (only red or white in EN54-23).

Different light dispersion characteristics are required according to the VADs intended mounting position. Wall-mounted VADs will be effective in a wide range of applications, but the manufacturer will be required to state a mounting height; which is a minimum 2.4 metres, followed by the width of a square room over which the VAD will provide coverage. Therefore, the specification code with a VAD suitable for a wall application could read W-2.4-6; that is, mounted at a height of 2.4 metres the VAD will cover a room six metres square. The VAD will therefore be required to cover the volume below its mounting height. Any light going upwards will be wasted as far as this categorisation is concerned.

Ceiling-mounted VADs are suitable for broad coverage in regular shaped rooms. Ceiling VADs must state the height of the ceiling at which it is designed to operate. This can be three metres, six metres or nine metres. The VAD in this case needs to radiate light in a cylinder below the mounting point. Therefore the specification code could read C-6-6; that is, mounted at a ceiling height of six metres, the VAD will cover cylinder six metres in diameter.

The open class category allows for different light distribution patterns that do not fall within the restrictions of the wall or ceiling. The shape of the pattern and its coverage volume must be determined and stated by the manufacturer; however the minimum illuminance of 0.4 lm/m^2 is still required.

Design

External factors can have a significant impact on the effectiveness of VADs. LPCB COP 0001 advises that when designing systems incorporating VADs, it is important to consider what these influences, such as the level of ambient light, the reflectivity of surfaces, effect of colour, the required field of view and the use of tinted eye protection may have at the onset of the design.

• Ambient Lighting

Because of the large variations in ambient light levels that can exist in some locations, it is important that the highest level expected should be considered when selecting VADs. Measures to control the ambient light, such as blinds or curtains may help reduce its impact. A lux meter complying with BS 667 should be used to determine the ambient light levels, although it should be considered that light levels in some rooms with large window areas will vary throughout the day and from season to season.

• Reflective Surfaces

It is important to assess and understand the types of surfaces involved as different materials will react differently to the emitted light. The reflection of light may be specular; for example, a glass mirror or diffused reflected light in many directions such as from a granular surface. Many surfaces will exhibit both types of reflections.

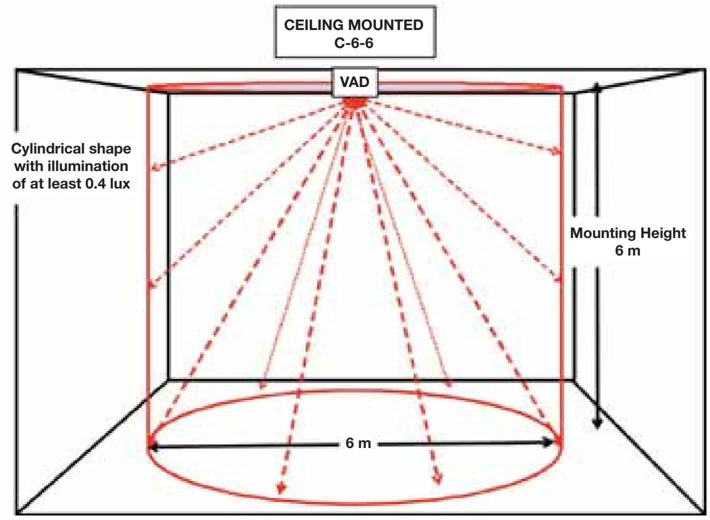
• Field of View

Consideration should also be given to the presence of any obstructions in the field of view, such as partitions or furniture, as this could affect the VAD coverage. At any position within a space where a VAD is required, any individual should be able to view its light directly or reflected from adjacent surfaces.

Environment

The selection of VADs should also take into consideration the nature of the environment where it is intended to be installed. Type A VADs require a minimum ingress protection (IP) of IP21C, while Type B require a minimum IP of IP33C for more exposed locations.

When considering the siting and spacing of VADs in a room, it should be ensured that all occupants of the room have a clear line of sight of the device, but there should not be undue dependence on this in applications such as an office, where people predominantly spend their time looking at computer screens or focusing on a specific activity. Reflective surfaces can increase the field of vision by providing multiple paths for the light to attract attention. Where the space to be covered is larger than the specified coverage volume of a device, a sufficient number of devices should be sited to ensure the required illumination levels are satisfied.



Power Consumption

To meet the requirements of BS EN54-23 and cover the practical room size encountered in most situations, VADs will be required to have higher light output levels than those generally used in the market today. Higher illuminace levels will result in a significant increase in current consumption due to the use of higher output devices or to a greater number of less powerful units.

Application of the inverse square law to light radiating from a point implies that: "to double the distance from a light source will require four times the power to achieve the same level of luminosity". LED technology can offer a breakthrough here, offering more efficient production of light, leading to lower power requirements than Xenon tube-based devices. Although the initial cost of LED VADs may be slightly more expensive than Xenon products, the more efficient operation that LEDs offer means the number of devices required on an alarm circuit is reduced, consequently reducing the burden on control panel power supplies and decreasing installation costs by avoiding supplementary power supplies. This should be considered in the design of a system.

A further strain on power consumption can be the flash colour. Across most of Europe a flashing red light denotes a fire alarm signal; however red light consumes more power than white light for the same intensity. To achieve red light, white light, particularly from xenon tubes, has to be filtered by a lens that allows, only the red wavelengths to pass through. This can reduce the light output by up to 80 percent and therefore require more higher-output devices to achieve the require illuminance levels.

The BS EN54-23 requirements of 0.4 lm/m^2 means that using red light requires a big increase in current compared with the same illumination using white light; this is exacerbated when room size is factored in. System designers are presented with a dilemma; should they offer a white flash to save power consumption and move away from the traditional red light associated with fire, or should they factor in the price of additional power supplies and installation costs, significantly increasing the total cost of the system?

Ahead of 1st March 2013 when BS EN54-23 becomes mandatory, it is an opportunity for the industry's leading manufacturers to build on existing expertise and experience to develop innovative solutions to the issues of power consumption and the challenges that light output and flash colour present.

The choice to use red or white VADs may not just be down to cost, the long established use of red for fire in some organisations may require a change in culture and retraining, but it should also be considered that whatever colour is chosen, it should be used consistently across the whole site, so existing beacons may have to be removed or changed.

Ahead of 1st March 2013 when BS EN54-23 becomes mandatory, it is an opportunity for the industry's leading manufacturers to build on existing expertise and experience to develop innovative solutions to the issues of power consumption and the challenges that light output and flash colour present. This should make the transition as easy as possible for those operating in the industry, including risk assessors, installers, system designers and commissioning officers. IFP

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SigniFire
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Magali Epin

Siemens Building Technologies

Fire Safety: A tall Order?

Urbanisation is one of the most challenging megatrends that the world currently faces. In 2007, for the first time in history, more people lived in cities than in rural areas. By 2030, over 60 percent of the world's population will reside in urban centres.

A natural consequence of urbanisation is the move towards building up rather than out. The scarcity and therefore cost of available building space, coupled with the drive to maximise rental or sales income for every square meter, is increasing the number and also the height of high-rise buildings. For fire safety engineers, security officers and firefighters this brings its own specific challenges in terms of how best to protect the buildings and the people that live and work within them.

Many of the world's tallest buildings are iconic. This is particularly true, for example, of the Middle East where the drive to construct tall buildings such as the Burj Mubarak al Kabir in Kuwait, set to become the world's tallest, derives less from a necessity to cope with land scarcity than from a desire to create true landmarks for the region. For these high-profile superstructures, the stakes are considerable: the necessity to create icons, driven by increased competition for investors in the region and the need to attract tourists in greater numbers, is reflected by the level of technology implemented in these buildings. Providing the comfort and luxury expected by the tenants in such buildings requires a lot of cabling – climate control, lighting features, multi-media and communication technology – which itself increases the fire load.

Accommodating Asia's Expanding Population

For Asia, where the increasing density of the population is particularly acute – urban population in the continent is rising by 37 million a year – it is less about creating architectural landmarks and more about pure necessity. Although there are not a lot of statistics relating to high-rise buildings in Asia, the fact that the continent accounted for 34 percent of all high-rise buildings worldwide in 2005 helps to illustrate its importance. However, although high population density in the major conurbations is the main driver, the propensity towards creating an iconic statement is also undoubtedly still a factor for this region. For example, Hong Kong's tallest building, the International Commerce Centre (ICC), is a 118 story, 484-meter building which provides the centrepiece to Union Square at the multi-million-dollar MTR

Kowloon Station Development. It has a seven-star Ritz hotel at its summit, 93,000 square metres of apartments, 230,000 square metres of high-quality offices, and a 93,000 square metre shopping mall.

The ICC is a good representation of how the nature of high-rise buildings has changed. Traditionally their prime function has been to provide commercial office buildings. However, as people relocate increasingly towards the areas in which they work, there has been a rapid shift towards multi-use with residential, hotel accommodation and retail outlets now ever more common features.

Combating the Terrorist Threat

The iconic factor of many high-rise buildings and the potential for the large numbers of potential casualties that they represent also increases the risk of terrorist attack. The World Trade Centre twin towers demonstrated all too clearly the worldwide impact that an attack can have when striking at such a status symbol. In fire and security terms, this means that terrorist threats need to be addressed. Although the threat can never be completely eradicated, it can be reduced. Given the multi-tenant and multi-use nature of the new breed of high-rise buildings, integrating security measures can be a significant contributor to protecting the building.

Tall buildings are characterised by a small number of entrance points, so the ID of each entrant can feasibly be validated through technologies such as ID cards, multi-tenant access control systems and visitor management systems. When these are integrated with intrusion and video surveillance systems, this more holistic approach to security can help prevent incidents occurring. However, as already indicated, no security system can be 100 percent fool-proof, particularly given the need to balance security with accessibility, and therefore effective response measures need to be put in place.

Evacuation Takes Time

Evacuation in a high-rise building is obviously one of the key issues that need to be addressed in any emergency response planning. By their very nature, tall buildings accommodate many people and a great deal of property – furniture and fittings – in an environment where movement is restricted by elevators and stairways. In surveys conducted with high-rise residents, security and safety issues were recurring themes. For instance in a survey undertaken in Singapore, Hong Kong and Australia all residents named fire among their top concerns. The statistics from a report by the NFPA (National Fire Protection Association) in the USA, also suggests that this concern over fire safety is far from unfounded. The "High-Rise Building Fires" report cites apartments, hotels, offices and facilities that care for the sick as accounting for roughly half of all high-rise fires in the USA. Between 2005 and 2009, an estimated 15,700 reported high-rise structure fires a year resulted in associated losses of 53 civilian deaths, 546 civilian injuries and $235 million a year in direct property damage.

For the fire service, accessibility is obviously a major issue in high-rise buildings. This, coupled with the increased fire load, means that automated extinguishing is often employed. This helps prevent the fire spreading vertically, particularly in multi-use buildings that are characterised by large amounts of cabling. Building management and security systems for controlling smoke, elevators and doors are also often used, with smoke being a much greater threat to human life than fire itself. This was illustrated by a fire at the President Hotel in Bangkok in February 1997. Smoke swept through the 36-storey building and although the fire was shown to have started on the second floor, a number of fatalities were found on the building's top floors.

The human factor in an emergency is a consideration in any evacuation planning but in high-rise buildings it is particularly pertinent. The increase in occupant load through the sheer numbers involved means that how people respond in an emergency takes on an even greater significance. The reduced number of entrance and exit points in a tall building is a benefit in security terms but in evacuation terms it certainly is not.

A typical 18-storey building may take up to 30 minutes to be totally evacuated. As the number of stories increases, so does the evacuation time: a 50-storey building can take up to 75 minutes while in some of the most recent superstructure buildings, it can take as long as two hours to fully evacuate using the traditional staircase approach. This has led to many tall buildings adopting a zoned evacuation policy whereby people go to a safe area and wait there to be evacuated. However, this approach is very much dependent on quick and clear communication, instructing occupants to remain in place, as the natural instinct for most people will be to try to evacuate.

Evacuation via stairwells is still the traditional approach; however, there is on-going research into how elevators can be employed in evacuation scenarios. Received wisdom is that elevators should not be used and instructions via voice-based systems often specifically tell people not to use them. However, as buildings get taller and the corresponding evacuation times longer, alternative options are being explored. The Burj Khalifa in

Dubai, the world's current tallest building at 828 meters, with its bottom 39 floors housing an Armani hotel incorporating 160 guest rooms and suites and 144 residences, is the first mega high-rise in the world where certain elevators can be programmed to permit controlled evacuation in the event of a fire or security threat.

Addressing the Human Factor

When we talk of natural instincts, although it might be considered reasonable to assume that the 'fight or flight' instinct will be common to just about all involved in the heightened sense of emotion generated by an emergency situation, believing that everybody will respond in the same way is a high-risk assumption to make. Many people will believe a ringing alarm is either a test or a false alarm, particularly in a building that has been subject to regular incidences of false alarms. This can cause hesitation or, in worst case scenarios, complete disregard for the alarm.

Even if the alarm does instigate action, what form that action will take is open to question. If people are in unfamiliar surroundings, they are more susceptible to panic, not knowing what to do or where to go when a simple tone-based alarm sounds. The fact that tall buildings have more people in them and many such buildings are subject to a higher ratio of infrequent visitors means that this is a particular consideration. If you take hotels as an example – and this is an area where high-rise is becoming an increasingly common option – it is highly likely that guests are unfamiliar with the surroundings. Voice evacuation systems certainly help in this regard by following-up the alarm tone with a spoken message giving specific instructions. Some systems can also deliver live information rather than just pre-recorded messages to allow the evacuation to be better coordinated and the messages specifically tailored to the changing requirements as the emergency unfolds.

The introduction of mass notification systems has also helped to develop this more structured and more considered approach to evacuation. Multi-modal mass notification not only warns people of danger, but also provides concise instructions via live or pre-defined messages over multiple communication channels, often utilising mobile phones and instant messaging, to guide them to safety in potentially life-threatening situations.

Coordinating the Emergency Response

To ensure efficient incident management in rapidly evolving building environments, there is a need to look towards performance-based codes and systems that can help better address today's challenges in emergency response and evacuation. The present move towards intelligent response systems to support the human response is a consequence of this, driven by technological advance in IT and communications.

For those responding to an incident, speed and agility are critical. This requires situational awareness and automation of processes to free-up resources to tackle the more critical areas or stages of the incident. Command and control systems are increasingly being adopted that use one platform to control both emergency and non-emergency systems. Taking a fire or an earthquake in a high-rise building as an example, a number of different personnel could well be involved in responding. The fire service will typically be the first responder but a major incident could well require support from medics, police, security personnel and engineers. Coordinating the response and ensuring swift and, importantly, clear lines of communication between the different elements is critical. Real-time evaluation of the evolving incident and relaying that information in a structured and pre-planned way can not only save lives but also significantly reduce building damage, the environmental impact that a major fire can have and keep the recovery time to an absolute minimum.

Tall buildings undoubtedly provide their own fire safety challenges. The regions in which they are built, the number of people they accommodate and their value – both in monetary and symbolic terms – all contribute to the need to prioritise their protection. IFP

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Railway Station Safety Challenges

Erika Görge

Bosch Security Systems

Central train stations are critically important strategic transportation hubs. In the future – particularly in light of on-going urbanisation, the emergence of megacities and the need for mobility – their importance will continue to grow.

In recent years there has also been a strong trend towards a more universal use of railway stations, with many now accommodating not only train platforms and waiting areas, but also retail outlets, hotels, offices and other service providers.

With the increasing usage, size and complexity of railway stations, comes the need to guarantee the safety and security of passengers, staff and goods. While the need for airport safety is widely discussed in the public arena, railway station security remains largely an "internal" issue, although the requirements are very similar. In all cases, a comprehensive security and safety system that incorporates fire alarms, public address and evacuation systems, as well as intrusion detection, access control and video surveillance is needed.

The Challenge

Operators of large railway stations are faced with a wide variety of challenges. Large crowds of continuously moving people, unchecked luggage, high noise levels and expansive indoor and outdoor space make conditions particularly testing. Only state-of-the art technology can meet the

challenge of securing railway stations. When selecting a system, quality, reliability and interoperability are the key considerations. Total solution providers help to create easy-to-operate solutions that are highly interconnected and meet these complex challenges. And, since no two train stations are the same, the system must be capable of being tailored to meet the specific needs of each location.

The Need for Comprehensive Systems

To enable efficient and reliable control of all systems, they need to be integrated into a single security system with central operations and management. This can be achieved using a comprehensive building management system. Centralised systems of this kind can also be used to monitor other technical systems such as conveyors, heating, ventilation and air-conditioning.

The Risk of Fire

It is never possible to rule out the risk of fire. High fire loads like cabling networks and onsite technical equipment, as well as the inattentiveness of passengers or staff pose a constant risk of fire. Fortunately, most fires can be dealt with swiftly, without causing serious damage or need for evacuation, provided they are detected early enough.

This requires all parts of the building to be covered by high-quality fire detectors. These devices need to be powerful and intelligent enough to cope with the special challenges, such as high ceilings and expansive open areas that railway stations present. Furthermore, the system needs to be capable of localising in-coming alarms – the more accurately the better. In a large train station hall, the information that a smouldering fire has been detected somewhere in the building is not particularly useful to firefighters. Modern alarm panels with intelligent bus systems are a reliable way of identifying and localising individual alarms. To achieve this, optical, thermal and chemical sensors, with varying levels of sensitivity are used in different areas of the building.

Securing Three Million People

Sao Paulo is a city known not only for its colourful carnivals, but also for its major traffic problems, urban pollution and crime. Sao Paulo's subway system, consisting of five different lines and 55 stations, plays a central role in the city's public transport network. It represents an affordable, reliable and clean way to transport around three million passengers every day. However, the subway and its stations were also known for being very unsafe. Its operator, Metro SP, was looking for a sophisticated electronic monitoring solution that included digital video recording technology.

Trends, a Bosch-verified integrator won the project and specified Bosch products. In just nine months, Trends installed the subway's new monitoring system with 121 fixed and 17 dome cameras. These are managed by ten DiBOS digital video recorders and a BIS video engine. The video management system is monitored by the subways' security control centre, which now serves as a model for transport monitoring in the region. The control centre monitors 200 cameras altogether using a ring gigabyte network. Two control posts constantly monitor the five metro lines via six monitors and two plasma screens. The newly-installed system helps staff detect situations faster and react appropriately.

In railway stations, there are usually different areas with individual requirements for the fire alarm system. Here, modular and networkable systems offer the ideal solution. They not only facilitate the deployment of individually configured and scalable fire panels to different sections of the station, but also enable networking between multiple panels spread across the building. This allows the networked panels to be operated and managed as a single integrated system. They can also be used as part of an overall system that encompasses access control, intrusion detection and video surveillance.

Detecting Threats

Detecting every potential threat in a busy rail station would prove an impossible task for security personnel, without the latest surveillance technology. At railway stations, large indoor and outdoor areas with varying patterns of traffic must be secured. Dedicated cameras at specific points such as automated ticket machines and turn styles are also needed.

To negate the possibility of human error, the latest Intelligent Video Analysis (IVA) technology should be used; unlike human, it never lacks concentration or misses an event. IVA can be used to automatically detect suspicious behaviour or identify abandoned luggage and bags, and a useful forensic search feature allows for the rapid retrieval of video sequences. A video management system enables the complete management of all individual video surveillance components.

Regulating Access

A railway station is an extremely diverse environment. They are open to the public at all hours of the day and night and are passed through by tens or hundreds of thousands of people every day. This makes effective and reliable access control a top priority.

The system used needs to enable the operator to know, at any given time, who has entered or attempted to enter a restricted area like luggage stores, ticket offices or maintenance rooms. To prevent the misuse of access cards, it is best to use biometric recognition systems. Closely linked to the access control system is a modern intrusion system that will keep unwanted guests out of control centres, retail shops and other restricted zones. Modular intrusion alarm systems have a flexible system architecture that can be adapted to fit all possible layouts.

In Case of Emergency

Planning and preparation for the worst-case scenario is key. In the event that a railway station needs to be evacuated, huge numbers of people must find their way out of the building quickly and safely. Voice alarm systems will play a critical role in evacuation procedures, for example, by guiding people to the nearest exit or instructing them to take their baggage in event of a bomb threat, but leave their belongings in the event of fire. During normal operations the public address system can provide passengers with information, such as the announcement of train departures and arrivals.

From a technical perspective, an effective PA system is one of the most difficult areas to get right, because the system needs to be adjusted to fit each individual premises and acoustic conditions. Announcements and warnings must be easily understandable despite high noise levels. The ideal system for this type of application delivers maximum reliability and speech intelligibility for large scale applications and automatically adjusts announcement volume to match the ambient noise level.

The bigger Picture

Studies state that by 2030, 60 percent of the world's population will live in urban environments. Train stations, subways and other public transport networks will play a critical role in keeping urban dwellers on the move, hence the need for comprehensive safety and security systems. The technology needs to be flexible, functional, easy to operate and capable of dealing with very different environments. When planning such a system experienced experts and a complete solution provider are needed. In the end, the system will need to fit together like a train fits onto its tracks. Only with well-planned and structured security and safety measures can railway stations cope with their increasing future importance. IFP

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Fire-Related Crowd Behaviours:

An Alarming Response

Rose Challenger

Socio-Technical Centre, Leeds University Business School

Understanding how crowds typically behave during a fire is critical to improving evacuation and, ultimately, to saving lives.

Let me begin by setting the scene – one with which I imagine most are familiar. You are in the office. The fire alarm sounds. What do you do? You know, having had your evacuation training, that you should really leave immediately via your nearest fire exit and make your way to the designated assembly point. But instead, you look around the office to see what your colleagues are doing. They are doing the same. Nobody is moving. "It'll be a false alarm, it'll stop in a minute", someone says. You all stop and listen intently. Still, nobody is moving. The alarm stops. "Told you it would be a false alarm". You nod and continue with your work.

This reaction (or non-reaction) is typical human behaviour. Contrary to common perception, the key danger in emergencies is not that people panic and act irrationally, but that they typically delay or fail to take appropriate evasive action. For example, in an analysis of the evacuation of the World Trade Centre on 11th September 2001, it was found that only 8.6 percent of people fled as soon as the alarm was raised. The average time for individuals to abandon their usual activities and begin evacuating was between five and eight minutes. Staggeringly, some people continued their normal behaviours for up to 30 or 40 minutes after the planes hit; sending emails, shutting down their computers, or going to the toilet before leaving the building.

During a fire at a disco in Gothenburg, Sweden, in 1998, many crowd members dismissed the smoke they observed and smelled simply as dry ice or as coming from the smoke machine and continued dancing. Moreover, when told about the fire by one of the disc jockeys, many of the crowd ignored the warning, believing it to be a joke, and again continued dancing. Similarly, eyewitness accounts of a fire at the high street store, Woolworths, in Manchester in 1979, report that many people were reluctant to leave the canteen without paying for their food or finishing their meal. In an analysis of people's behaviour during the major fire at the King's Cross underground station in London in 1987, rather than panicking, individuals continued their normal behaviours, however inappropriate.

It is these kinds of behaviour during fires of which we need to be more aware. If we enhance our understanding of how crowds characteristically behave during a fire (or, indeed, any other emergency situation), we should be able to better predict how they will behave in the future and, therefore, better plan for and execute emergency evacuations, ultimately helping to save lives.

So why do people behave this way? One possible explanation is the psychological theory of 'place scripts' – sequences of behavioural patterns in which individuals automatically engage when in a familiar environment or experiencing a particular event. People are instinctively drawn towards the familiar, for example, preferring to enter and exit an environment or building via the same route. However, since fires are relatively rare and, therefore, non-routine, people are unlikely to have scripts suitable to guide their actions. Consequently, they will typically act as normal for as long as possible, despite the inappropriateness and danger. Only when clear information and specific instructions are provided to guide appropriate evacuation behaviours, can individuals override their scripts and break with their routine behaviours. Thus, the more familiar people are with a particular setting, the more at risk they may actually be in a fire.

Consider, for example, the behaviour of football fans observing Bradford City play their final game of the season against Lincoln City on 11th May 1985. A fire broke out in Block G of the main stand, thought to be caused by a discarded cigarette or match falling through a space beneath the seats in the stand and igniting a deep pile of rubbish. Despite being aware of their feet becoming warmer and spotting the flames beneath the stand, the majority of fans did not react and, instead, remained seated and continued to watch the match. It was not for another four to five minutes, when the smoke became dense, the flames became more visible and the police began to evacuate the stand that the fans actually began to move. The whole main stand was ablaze within about six minutes of the fire igniting. In total, 56 people died and hundreds were injured.

The Bradford City disaster illustrates the potential consequences of a lack of training and understanding about human behaviours in fires. The seriousness of the situation was significantly underestimated by stadium officials, police officers and fans alike, as was the speed at which the fire would escalate and the importance of reacting

immediately. It was considered to be a "minor incident" and "of no particular significance". Therefore, fans continued to watch the match as normal and did not begin an emergency evacuation as soon as was possible.

However, it is not only this lack of immediate reaction during a fire that needs to be taken into account. There are also other typical crowd behaviours that we need to understand in order to enhance the evacuation process. For instance, we need to be aware that families behave differently than do individuals within a crowd. The affiliation model proposes that, when faced with an emergency or threatening situation, people are motivated to move towards familiar places and people. This is thought to have a calming effect, reducing our innate 'fight or flight' instinct. For example, studies of mass evacuation have found that family groups do not break down in fires, but attempt to evacuate together and remain united as a group, focusing on collective rather than individual survival. Families prefer to delay evacuating (backtracking if necessary) until all members are able to leave together; faster family members will delay their own escape to ensure the safe evacuation of slower family members. Similarly, crowd members unfamiliar with an environment will typically follow other evacuees during an emergency, resulting in herding behaviour, when one exit becomes clogged while another exit is highly underused. Awareness of these familial behaviours is vital.

We also need to understand that, contrary to popular perception and media portrayal, 'panic' (and the irrational, antisocial and self-centred behaviour associated with it) is a very rare occurrence during fires. To take examples from the UK and USA, panic was not observed at the Summerland leisure complex fire in 1973, the Beverly Hills Supper Club fire in 1977, the Stardust nightclub fire in 1981, the Bradford City fire in 1985, the King's Cross underground station fire in 1987, the Ladbroke Grove rail disaster in 1999, the Station nightclub fire in 2003, the collapse of the World Trade Centre in 2001, the London bombings in 2005, or the Hudson plane crash in 2009. Instead, research observes coordination, cooperation, helping behaviours and personal sacrifices among unfamiliar crowd members. According to the self-categorisation approach, the

In an emergency, people will typically act as normal for as long as possible, despite the inappropriateness and danger. Only when clear information and specific instructions are provided to guide appropriate evacuation behaviours, can individuals break with their routine behaviours.

common experience of threat or emergency is thought to create a sense of 'we-ness' and solidarity among crowd members. There is a shift in focus from 'me' to 'us', enabling the crowd as a whole to act as a source of strength for individual crowd members.

This knowledge and understanding of people's typical reactions to and behaviours during a fire (or similar emergency situation) has important implications for emergency evacuation procedures.

For instance, clear communication and provision of information about the threat of fire are the critical factors in helping crowd members break from their place scripts. They make crowd members aware that the danger is real and, thereby, of the need to react immediately and initiate evacuation. In order to be believed and interpreted accurately, warnings about a fire must be specific, comprehensible, from a credible source, and convey the nature and extent of the danger. Furthermore, specific visual and verbal instructions are needed – fire alarms alone are often interpreted as meaningless (and somewhat annoying) noise. For example, research has shown that crowd members often struggle to distinguish a fire alarm from other types of alarm, for example, a burglar alarm or security door alarm, and that experiencing a large number of false alarms and fire drills reduces crowd members' confidence in the alarm being an indication of a real emergency.

Warnings should also be immediate – delaying for fear of causing panic only serves to reduce evacuation time and, thereby, unintentionally increase the risk of casualties. Providing more, rather than less, information about the nature of the fire should encourage the crowd to trust authorities, which is crucial for effective evacuation; withholding information simply leads the crowd to mistrust authorities, and to question whether they are providing accurate information in future emergencies. Limited information about a threat and lack of immediate communication simply makes the whole crowd more vulnerable. Had such communication and information been provided immediately during the fire at Bradford City described earlier, fans may have recognised the seriousness of the situation and evacuated without delay.

Once crowd movement is initiated, additional action is required by those in charge to help prevent the evacuation process being further slowed by typical crowd behaviours. For instance, as outlined earlier, during a fire crowd members typically prefer to leave by a familiar route – the way they came in – as opposed to an emergency exit, while families prefer to wait and evacuate together as a group. Therefore, additional communication, instructions and guidance are needed to make the crowd aware of the most appropriate evacuation routes and to direct appropriate crowd movement, helping to enhance the evacuation process.

Plentiful and knowledgeable stewards should be available to physically guide the crowd towards emergency exits, particularly underutilised ones. Crowd members should also be encouraged to form queues at emergency exits, enabling faster crowd flow and increasing evacuation effectiveness. Visibility of exit routes and emergency exit signs should be maximised; the more visible they are, the more attractive they are likely to be to crowd members, and the faster crowd members should be to follow those routes.

Leader figures – either from the authorities or from within the crowd itself – play an important role in the evacuation process, both in relation to initiating and directing movement. However, the spatial positioning of those leaders is influential over both the speed and accuracy of crowd movement, with leaders positioned in the core, rather than the periphery, of the crowd – that is, in close proximity to other crowd members – more likely to be influential over crowd movement. Therefore, careful consideration must be given to the number of individuals within the crowd (whether these are stewards or crowd volunteers) who should be made aware of the location of emergency exits, and where these "informed individuals" should be positioned within the crowd to most effectively act as leaders in an emergency evacuation.

It is also important to recognise that crowd members are highly unlikely to panic during a fire but, rather, will feel united by the common threat experienced and will exhibit coordination, cooperation and helping behaviours, and make personal sacrifices. Emergency responders should make use of the crowds' resilience and willingness to help during an emergency, and provide them with clear instructions about how they can be of assistance.

Thus, there is much for us to learn about how crowds typically behave in fires, which has subsequent implications for emergency evacuation procedures. By enhancing our understanding of how crowds characteristically behave during a fire, we should be better placed to better predict how they will behave in the future and, therefore, better able to plan for and execute emergency evacuations, ultimately helping to save lives. IFP

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For further information, go to www.crowdbehaviour network.org/

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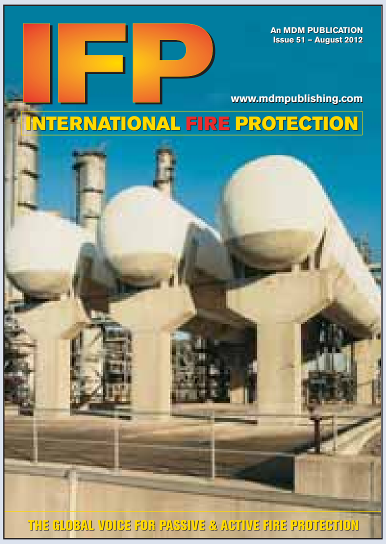

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THE GLOBAL VOICE FOR PASSIVE & ACTIVE FIRE PROTECTION

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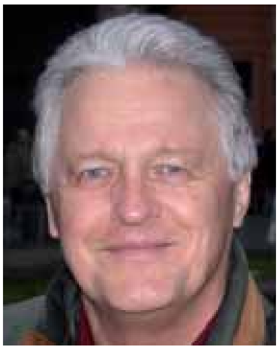

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Education's the Key

I am sure some readers will consider what they are about to read to be a gross over-simplification, but here goes. When it comes down to it, there are three essential elements to achieving fire safety: first, making sure a fire does not occur in the first place; then, if a fire does break out, detecting it and raising the alarm as swiftly and effectively as possible; and finally, ensuring the safe evacuation of those at risk. Certainly, extinguishing the fire is important but, if the first three elements have been successfully completed, the lives of the occupants should no longer be at risk.

I would like to focus attention on the first and third of these elements – making sure a fire does not occur in the first place, and ensuring the safe evacuation of those at risk. This is not because I feel that detecting it and raising the alarm swiftly and effectively is not important; far from it. It is merely that fire detection and alarm technology has advanced so much in recent years that this element is relatively easily achievable providing, of course, that the best available professional advice and guidance is sought.

Guarding against a fire breaking out is, in large part, down to the effectiveness and integrity of the passive fire protection measure adopted by the building or structure's designers. The same can rightfully be claimed for safe evacuation. But, in both cases, there is an element that is not within the direct and long-term control of those making design or construction decisions, and that element is human behaviour.

The one-time Lord Chancellor of England, Sir Thomas Bacon, is often attributed as having coined the phrase "knowledge is power" and this is certainly the case when it comes to fire safety. It is possible to have a building that incorporates the most well thought out passive fire protection and the most reliable and sophisticated detection and alarm, but if the occupants lack the essential knowledge, the effectiveness of both may be seriously reduced.

So, educating occupants and, where possible, visitors is absolutely essential if their role in avoiding a fire in the first place or their performance if a fire breaks out is not to be jeopardised. But it is not enough to leave it to chance or ensure that just the building's fire officer or safety officer (or in the UK, the "responsible person") has the knowledge; this must filter down to every level and include temporary staff, contract staff and part-time workers.

Ironically, the sophistication of today's detection and alarm systems has the potential to lead employees into falsely believing that they do not have a role to play in ensuring fire safety. It is still possible to stay in a hotel just about anywhere in the world to find fire doors propped open – absurdly, often using portable fire extinguishers – to facilitate quicker cleaning, or fire exits blocked by baskets containing soiled bed linen. Sadly, the potential impact of these infringements looks minimal when compared with too many parts of the world where fire safety measures are so lax or non-existent that emergency exits are habitually locked and windows are barred – where fire safety comes a very poor second to security.

But, do not confuse telling someone as being the same as educating them. It is not just a matter of briefing staff on what to do; for them to fully appreciate the consequences, they must fully understand the potential impact of their actions. Put simply, they need to be educated in fire safety, and achieving this goal may well be the biggest hurdle yet to be jumped in the quest for universal fire protection. IFP

New Generation of Portables

CHUBB FIRE & SECURITY UK has launched its FX range of fire extinguishers that feature what is described as an innovative quick release mechanism and an ergonomically redesigned handle, lever and hose grip. The new range is lighter in weight, easier to use and many models also offer enhanced fire ratings.

The FX range is being promoted as meeting the demand for a new generation of products that are easier to handle, lighter, more intuitive to use, and deliver the highest performance when people or property are at risk. The new design will ultimately feature throughout Chubb's family of water, foam and powder products.

A key element of the FX extinguisher range is the high-performance, engineering-grade plastics used in the handle and lever design, compared with metal. The FX range also features: increased lever length so that the handle and lever can be more comfortably compressed; sufficient clearance between the handle and lever when compressed to prevent fingers from being trapped; and increased handle breadth to rest more

comfortably within users' palms. Other features include modified handle shape for safer handling and improved corrosion resistance for the handle and valve assembly.

In terms of the safety release mechanism, the traditional pin that prevented the extinguisher from being discharged accidentally has been replaced with an easy-pull clip with arrows to show a clear direction of 'pull' in order to activate the extinguisher. When the clip is pulled, the word 'USED' then appears. Another key feature of the new FX range is the grip on the hose to make extinguisher use more intuitive such that the user is immediately 'guided' to where the hose should be held.

The FX range has been designed for environmental safety and end-of-life recyclability and does not contain any materials of concern. All materials meet or exceed BS EN3 requirements, such as additional UV degradation tests and resistance to ozone and chemical substances. The FX range also complies with the British Standard Kitemark where required and the Pressure Equipment Directive (and where necessary the Marine Equipment Directive) and feature the CE mark and/or Ships Wheel. For more information, visit

For more information, go to www.chubb.co.uk

New Stainless Steel Devices

C-TEC has added a range of stainless steel devices to its innovative Quantec addressable call system range. Said to be ideal for creating a stylish impression in prestigious reception areas or at sites where vandalism has been reported, the devices are described as high-quality, durable and competitively priced. Their launch means that virtually every existing Quantec call point and corridor display now has a counterpart crafted from brushed stainless steel.

Of particular interest to customers involved in large projects at hospitals, prisons and secure psychiatric units, for example, the text on each device is printed using a process called 'Cermarking' to facilitate straightforward customisation to suit specific applications.

For more information, go to www.c-tec.co.uk

First Smoke Control Certification Scheme

Believed to be the first certification scheme of its kind for smoke control systems has been announced by Warrington Certification working with the Smoke Control Association. The scheme is intended to provide further credibility for installers of fire safety systems, and reassurance to specifiers and designers of the level of safety being applied.

For more information, go to www.warringtoncertification.com

Cable Authorised by London Underground

Cable manufacturer, TRATOS, has announced that its Firesafe TW950e cables have been approved to London Underground Limited (LUL) standard 1-085 A3 and are now authorised for use in sub-surface locations, including tunnels and underground stations.

In addition to sub surface locations, Firesafe is also suitable for use in high rise buildings that do not have sprinkler systems and have passed evacuation arrangements, or large premises where areas remote from the fire could remain occupied on the condition the fire does not damage cables serving the alarm system in those locations.

TW950e is an enhanced fire resistant cable for systems needing to operate fully during a fire for longer periods than those normally required for single-phase evacuation; these include fire detection, alarm and emergency voice communication systems.

In addition to LUL standard 1-085 A3, the cable also conforms to BS7629-1:1997 (incorporating amendments one and two), meets class PH120 in accordance with BS EN 50200:2000 and meets the requirements of enhanced fire resistant cable as described in BS 5839-1:2002 clause 26.2,defined in BS 8519.

For more information, go to www.tratos.co.uk

PROFILE

IWMA 2013 Water Mist Seminars

First 2013 seminar to be held in Dubai in January during Intersec

For the International Water Mist Association (IWMA) the year 2012 has indeed been busy and exciting. Busy, as with yet another successful annual conference, which this year took place in Barcelona, the IWMA was able to strengthen its position in the world of fire protection. Exciting, because of the move from the small town of Heyrothsberge near Magdeburg to the cosmopolitan city of Hamburg in the North of Germany.

But with 2012 drawing to a close, the IWMA is looking ahead and is concentrating on its future activities. In fact the main focus of attention at the moment is the six seminars on water mist fire protection, which the IWMA is currently planning.

The first of these seminars is going to take place in Dubai on 15th January at the Dubai International Convention and Exhibition Centre, which at the same time is host to InterSec. One of the companies that will take part in this seminar is VID Fire-Kill from Denmark. CEO Alex Palle says: "As IWMA member we appreciate this opportunity to attend the seminar and inform the audience about the latest knowledge within water mist systems, including how they work, what they can protect, and how they are approved." This certainly reflects the concept of the seminars, during which experts from different fields of water mist explain their schemes and answer questions from an international audience.

Apart from the seminar in Dubai there will be one seminar on 19th March 2013 in Hvidovre, Denmark at the DBI. The other four seminars will be held in France, Italy, China and India during the course of the year. And then of course there will be the 13th annual international water mist conference in the autumn. IFP

For more information, go to www.iwma.net

Intumescent Gasket Range Expanded

AICO has added two new ranges to its Firecap fire safety product line – intumescent gaskets and fire protection pillows.

The new Firecap fire protection intumescent gaskets are designed to offer 60-minute protection should a fire begin in a plug or switch box. In the event of fire, the gasket automatically expands to seal against the passage of fire and smoke from one compartment to another. The new gaskets were independently tested by Chiltern Fire to the relevant parts of BS 476: Part 20 and Part 22.

The gaskets are non-toxic and rot proof, no maintenance is required, and suitable holes can be easily made in the gasket during installation for cable runs. The gaskets are insulated with PVC to obviate the risk of any electrical short circuit due to the graphite content of this type of material.

The Firecap range of fire protection pillows is designed to create a temporary or permanent barrier around all types of services to prevent the passage of fire through a compartment wall or door. They are claimed to be both easy to install and offer long life.

The pillows are filled with organic fillers and intumescent additives with a waterproof glass cloth bag on the outside. Available in small, medium and large sizes, they are both non-combustible and non-toxic and remain flexible between –20°C to +130°C. Suitable for both indoor and external locations up to one square metre, Firecap pillows can be used where services are continually being changed or replaced and offer a minimum fire integrity of 60 minutes. Fire resistance has been tested in accordance with BS.476: Pt 20 and Pt 22 1987.

For more information, go to www.aico.co.uk

New Standard for Engine Compartments

SP TECHNICAL RESEARCH INSTITUTE of Sweden has published a new standard for fire suppression systems in engine compartments of buses and coaches – SP method 4912, edition 3. The work has been carried out in part on behalf of the National Road Authority in Sweden with the objective of constructing a model of an engine compartment where stakeholders can evaluate the firefighting performance of different suppression systems in a well-defined and objective manner.

The main objective of the research leading up to the standard was the promulgation of this standard at the UN ECE Working Group on General Safety Provisions in Geneva. Should the standard be accepted in this forum it will be required to have fire suppression systems installed in buses and coaches. In parallel SP has established a voluntary certification/quality mark for the industry – the P-mark, which certifies that the product meets the requirements of relevant standards, and regulations, and that the manufacturer or importer operates an approved inspection and quality control scheme.

To obtain a P-mark in accordance with SPCR 183, the fire suppression system will need to fulfill the requirements in SP method 4912 in which the capacity of the system to extinguish different types of fires is evaluated. In addition testing of all components as part of the system is also required. This means that detectors, electrical/electronic components and control panels will be performance tested for harsh environments, EMC, temperature and humidity extremes.

For more information, go to www.sp.se/safebus

More Third-Party Approvals

GRINNELL has announced that it has achieved further third-party approvals of its G-Press product line. The core range of G-Press stainless steel products, ranging from 22mm to 54mm, with existing VdS and FM approvals, is now LPCB (Loss Prevention Certification Board) approved. The VdS and FM certification has also been extended to the larger sizes from 54mm to 108mm.

For more information, go to www.grinnell.com

One-Hole Hanger

COOPER B-LINE, has developed what it claims to be an industry "first" with the introduction of its an industry first with its Fig 22L2 one hole hanger and restrainer, the only single fastener solution available for supporting CPVC and IPS piping to concrete ceilings. The Fig 22L2 features flared edges to help protect plastic pipe, no compressive loading of the pipe, and is cULus listed as a hanger and restrainer complying with NFPA 13 requirements.

The Figure 22L2 is available in sizes ranging up to 50mm and can support pipes vertically or horizontally for walls or ceilings. Its design allows installers to mount closer to fittings and has no compression value on CPVC systems. It can also be installed into wood or steel making it a versatile choice for mechanical and fire sprinkler applications.

For more information, go to www.cooperbline.com

Blast Protection at Doha Airport

PROMAT'S Durasteel fire and blast protection system is being installed to protect aircraft, passengers and ground staff at the New Doha International Airport. It has been used to encase a series of substation buildings that are located close to the airport's runways and taxiways.

The Durasteel barrier and ceiling systems created around the substation buildings provide complete two-way fire and blast protection. They have been designed to contain any transformer explosions that occur inside the substations, and also to protect the transformers housed in the buildings from external fires and blasts.

The composite panels feature a fibre-reinforced cement core that is mechanically bonded to punched steel sheets on both outer surfaces. They are classed as 'non-combustible' to BS 476: Part 4:1970, and to Clause 10 of EN 13501-1:2002. In addition to strength, the panels are cited as being extremely durable and resistant to the effects of both impact and moisture. The system is unaffected by the effects of firefighters' hoses and so retains its ability to perform as required, even during a fire.

For more information, go to www.promat.co.uk

Simulator Training for Dutch Railways

RescueSim, VSTEP's virtual incident training simulator, is being used by the Dutch Railways to train its personnel in tunnel evacuation procedures and railway incident management. The goal is to train all 6000 train drivers and conductors of the Dutch Railways during a one-year period.

The demand by the Dutch Railways for a realistic virtual training system came following the incident and fire in the Schiphol railway tunnel on July 2nd 2009.

To guarantee realistic training, a virtual tunnel environment and different tunnel incident scenarios were created in the RescueSim simulator. Railways personnel are fully immersed into the virtual training and need to respond to the created incident following the correct communication and evacuation procedures. To allow realistic simulation of all means of communication VSTEP developed the Communications Trainer. RescueSim and the RescueSim Communications Trainer allow realistic virtual training and full communications interaction between the train driver, railway guard and train passengers, simulating actual train tunnel incidents in virtual 3D.

Dutch Railways have installed multiple RescueSim simulators at five key locations within the Netherlands.

For more information, go to www.rescuesim.com

Tanzanian Hotels' Detection

Fike Protects Against Fire

A solution based on the FIKE Quadnet addressable system has been installed in a retail development attached to Dar es Salaam's most prestigious five-star hotel in Tanzania – the Seacliff Hotel and Spa – and a new Seacliff group hotel in Zanzibar.

Quadnet is a fully addressable system. Quadnet panels support up to four loops and up to 200 devices can be addressed on each loop. When loop-powered devices are used, each loop can typically support up to 110 detectors with integral sounders or up to 60 detectors with integral sounders and strobe lights. Fike multifunction detectors selected for the project provide a choice of fifteen combinations of heat and smoke detection modes, which makes it easy to accurately match the operation of the installation to the user's exact requirements, even if these change. When these detectors are used with Quadnet panels, their function can be set remotely from the panel without needing to access the detector itself.

For the retail development at the Seacliff Hotel in Tanzania, the system incorporates one Quadnet control panel, 110 multifunction detectors and 14 manual call points. The installation in Zanzibar covers five hotel blocks and incorporates a single Quadnet panel with 180 multipoint detectors and 38 manual call points. In the near future, the installation will be further extended to include an additional 70 detectors.

For more information, go to www.fike.com

New Fire Beacon Range

With the release of the European standard EN 54-23: (Fire alarm devices – Visual alarm devices) there is now fire industry standard that determines the light output, performance criteria and installation requirements of visual alarm devices (VADs) that comes into force on the1st March 2013. To meet the challenge COOPER FULLEON has launched a new generation LX range

With models for wall or ceiling applications the range consists of six products, five of which provide coverage of 7.5 metres. The Squashni G4 LX ceiling device however, features the largest coverage in the range reaching 15 metres, making it suitable for large public spaces. A coverage volume code can be found on each product ensuring it is fully compliant to EN 54-23. If installing the products in smaller rooms where a lower coverage volume is required, a switch feature reduces the coverage and flash rate by half, ensuring no power is consumed unnecessarily and costs are kept to a minimum.

The biggest challenge with EN 54-23 is cited as being to achieve the 0.4 lux over a wide area with the lowest possible current consumption. To meet the demands, delivering current consumption as low as 12mA, Fulleon's new LX range is built on the latest LED technology. This enables it to deliver low power and a stable and reliable light output.

The LX range's lens technology means the lens distributes light with "extraordinary efficiency". It refracts light to remove hot spots of light directly in front of the LED and then re-distributes the light to dark spots, Light without optical correction LX Range. Three flash options provide flexibility. For the economy installation, a white only flash option is available. Those with a preference for a red flash have two options; a red only flash or red ChromaPlus – an innovation capitalising on the human perception of light, to give the impression of a red flash while providing a much higher coverage than a red-only flash. This reduces the number of devices required in an area and consequently reduces installation and system costs.

For more information, go to www.cooperfulleon.com

New LED Emergency Lighting System

FULHAM has announced the introduction of its FireHorse brand HotSpot2 LED emergency lighting system. The system connects small-profile LED drivers and battery packs to the LED modules already in place inside existing LED fixtures that are driven by constant current sources. During a power outage, the drivers provide output current to the modules connected. With several sizes and types of optional interchangeable batteries (NiCd, LiFePo4), this plug-and-play emergency lighting system is claimed to offer a wide range of lumen output possibilities with expandable run times.

The HotSpot2 system is an expansion of the existing HotSpot1 series, which adds inconspicuous emergency LED lighting capability to non-LED fixtures such as wall sconces and recessed cans.

For more information, go to www.fulham.com

Nozzle Makes the Right Noises

SIEMENS BUILDING TECHNOLOGIES division has launched a new nozzle design that emits significantly lower noise levels when activated, ensuring that the discharge of the suppression agent does not harm the very assets it is intended to safeguard.

The Sinorix silent discharge nozzle produces one hundredth the sound pressure when compared with the market norm, addressing the concerns of inert gas systems causing damage to hard disk drives. The nozzle can be integrated into an existing fire safety system, allowing businesses to update their protection without having to undertake a complete replacement.

For more information, go to www.siemens.co.uk/buildingtechnologies

Piping System's Enhanced UL Listing

Fire protection and life safety systems company, VIKING CORPORATION, has received an expanded UL Listing for its BlazeMaster line of CPVC piping products that allows for exposed piping installations in basements with composite wood joists.

Previously, when sprinklers were installed in an unfinished basement with composite wood joists, a layer of drywall was required to cover the CPVC piping network. Alternatively, metal pipe could be used in these applications. With this new UL Listing, provided certain conditions are met, Viking's CPVC piping system can be installed exposed, without the need for additional drywall protection. The result is a lower total installed cost for residential sprinkler systems.

For more information, go to www.vikinggroupinc.com

Weight-Saving Insulation

MORGAN THERMAL CERAMICS has introduced its new FireMaster Marine Plus blanket, a lightweight fire insulation that provides weight savings of up to 30 percent compared with the standard FireMaster blanket and traditional mineral fibre fire insulation products. According to Morgan, its light weight makes it ideal for achieving improved fuel efficiency, faster speed, or even increasing available cargo capacity. The product also offers excellent acoustic and thermal insulation.

Engineered to meet the most stringent of performance requirements in a variety of aluminium, steel and composite bulkhead and deck structures, FireMaster Marine Plus blanket provides both cellulosic and hydrocarbon fire protection. Certified systems include Class A steel and aluminium bulkheads and decks, high-speed craft constructions built from two-millimetre aluminium plate, and 30- and 60-minute-rated composite sandwich panel bulkheads and decks.

It is available in rolls rather than sheets, and the product can be installed in larger areas without having to make joints. When installed in conjunction with stiffeners, the flexible material can be profile-wrapped

FireMaster Marine Plus blanket is certified to all International Maritime Organization (IMO) requirements and is ideal for any vessel required to have structural divisions. The product has also received Det Norske Veritas (DNV) "Type Approvals" and European Union Marine Equipment Directive 96/98/EC approvals for use in a variety of ship types, including ferries, naval vessels, tugs, barges, and cruise ships, as well as larger recreational yachts.

For more information, go to www.morganplc.com

Welcome Detection

KENTEC fire control panels were chosen for a new fire detection system installed at the Wellcome Trust Centre for Human Genetics, a research institute of the University of Oxford.

The Centre houses more than 400 occupants spread over three floors, and aims to explore all aspects of the genetic susceptibility to disease, including the understanding of how DNA variants contribute to the risk of disease in the population. When the university decided to replace the existing 10-year-old fire alarm and detection system, it was decided that the new system would be based around Hochiki's Enhanced Systems Protocol (ESP), Hochiki devices and Kentec control panels.

The project involved installing a Kentec Syncro 12-loop, 96-zone analogue addressable control panel and two Syncro Focus Network LCD repeater panels using the existing cabling infrastructure. Approximately 1,000 devices were installed including nearly 500 ACB-E analogue multi-sensors, which incorporate a variable temperature heat element and a rate-of-rise heat element, both of which are controlled from the control panel, allowing either one or both elements to be active in making the fire decision.

For more information, go to www.kentec.co.uk

Pumps Protect Europe's Tallest Building

SPP PUMPS has supplied fire safety pump sets for the Shard, a recent addition to the London Bridge quarter; at 309.6 metres, acknowledged as the tallest building in Europe.

The design of water supplies for such a high building presented a unique challenge, calling for sprinkler and wet riser pumps that have been subjected to the stringent performance and reliability tests of specialist fire approval laboratories worldwide. European sprinkler regulations do not allow the use of pressure reducing valves due to their unreliability, so zones had to be created to limit the pressure on the sprinkler heads in lieu of the valves.

This concept had never previously been applied to a building over 300 metres and SPP worked with the consultant, Arup, to create a solution that produced a quality, reliable water source that satisfied the challenging regulations. For the sprinkler pumps, SPP supplied two CD12K ten-stage pumps with seven take-off outlets to supply seven sprinkler zones in the building. The pumps were driven by 200kW motors. Each zone has its own jockey pump to maintain the pressure.

Three pump stations were installed at various levels in the building. At base level SPP supplied two BU06 split case pumps with 315kW motors to produce 4500 litres-a-minute at 24 Bar. The mid- and high-level pump houses were equipped with CD10K four-stage pumps with 132kW motors producing 3000 litres-a-minute at 24bar.

For more information, go to www.sppenergy.com

Protecting Marine Environments

The marine environment is unique. The demanding conditions faced by structures and vessels in these surroundings are also met by the equipment protecting them against fire. Having worked with clients in the marine sector for more than 30 years, Apollo is well placed to meet these challenges. It has developed two ranges fully approved for use in the marine and offshore environment both offering world class detection.

Apollo's Orbis Marine range offers a wealth of features to save installation and commissioning time, enhance reliability and reduce false alarms offshore. These include drift compensation, DirtAlert (a feature that warns service engineers via a flashing yellow LED that detectors need maintenance) and Apollo's patented FasTest, a procedure that takes just four seconds to test smoke detectors and confirm that they are functioning correctly. In addition, the range has a humidity tolerance at up to 98 percent relative humidity and an operating temperature of –40°C to +70°C.

Discovery Marine, Apollo's high specification, intelligent fire detectors have also been developed for marine and offshore systems. As with Orbis Marine, Discovery offers drift compensation. It also provides XPERT card addressing for increased security and day and night switching for increased reliability. In addition, its five response modes also give the reassurance that it can adapt to changes in this challenging environment.

For those offshore settings with hazardous areas (where an explosive mixture of gas or air is, or may be present) Orbis Intrinsically Safe (IS) is the ultimate solution. The equipment, designed for these very specific conditions, cannot ignite in an explosive mixture thereby giving the reliable, accurate fire protection for which the Orbis range is renowned.

Apollo prides itself on providing technology that is tried and tested. As such, both Orbis and Discovery Marine are approved by Germanischer Lloyd, Lloyd's Register of Shipping, Bureau Veritas, the Maritime and Coastguard Agency, the American Bureau of Shipping, Marine Marchande Francaise, Det Norske Veritas and the China Classification Society and Orbis IS is approved to more than 14 international standards.

All At Sea: Protection in Action

The Liao Hai is a roll-on, roll-off ferry. Measuring 115 metres long and 21 metres wide, it has the capacity to transport 650 people and approximately 100 lorries. The China Tian jin XinGang shipyard awarded the contract to supply an intelligent fire detection system for the Liao Hai to Apollo's representative in the region - Shanghai Jin Zhou.

The fire detection system installed includes around 200 Apollo intelligent detectors, including multisensors, which have been approved for marine applications by the China Classification Society following additional tests specific to the marine environment.

Most of the detectors used on the vessel have been fitted using Apollo's Deckhead mounting base. This is a robust back box, made from either aluminium or polycarbonate, for use with standard 100mm detector bases. The box gives extra protection when fitted in areas where there is the possibility of moisture or condensation getting in through the rear of the box. These boxes are also useful when securing bases to rough surfaces or in areas where there may be dripping water.

The Liao Hai fire detection system allows a two-minute delay in the event of an alert so that an incident can be investigated. If the alert is genuine, the system then proceeds to raise the alarm. Apollo interfaces with in-built isolators have been installed to enable the fire detection system to interface with other critical equipment on board. A fire alarm triggers a pre-set sequence of events to ensure that passengers can be evacuated safely. Actions include operating fire doors and dampers and closing down the air conditioning to the passenger and car decks to prevent the spread of smoke. IFP

For more information, go to www.apollo-fire.co.uk

New LX Fire Beacon Range

Cooper Fulleon launches a low current, maximum coverage solution to EN 54-23.

Prior to May 2010, there was no fire industry standard that determined the light output, performance criteria and installation requirements of visual alarm devices (VADs). This has now been rectified with the release of the European standard EN 54-23: Fire alarm devices – Visual alarm devices. The standard is mandatory from 1st March 2013, and Cooper Fulleon's new generation LX range is a low current solution to meet its challenges.

With models for wall or ceiling applications the range consists of six products, five of which provide coverage of 7.5 metres. The Squashni G4 LX ceiling device however, features the largest coverage in the range reaching 15 metres, making it most suited for large public space applications. A coverage volume code is on each product ensuring it is fully compliant to EN 54-23. If installing the products in smaller rooms where a lower coverage volume is required, simply use the switch feature to reduce the coverage and flash rate by half, ensuring no power is consumed unnecessarily and costs are kept to a minimum.

Unique LED & Lens Technology

The biggest challenge with EN 54-23 is to achieve the 0.4 lux over a wide area with the lowest possible current consumption. To meet the demands, delivering current consumption as low as 12mA, Fulleon's new generation LX range is built on the latest LED technology. This enables it to deliver low power and a stable and reliable light output.

The range's highly innovative and patent-pending unique lens technology means the lens distributes light with extraordinary efficiency. It refracts light to remove hot spots of light directly in front of the LED and then re-distributes the light to dark spots, where traditional solutions would fail to meet the 0.4 lux minimum requirement. It is important to control the available light accurately, as any light outside of the prescribed volume will waste power unnecessarily and

Flash Options

With three flash options to choose from, the LX range offers complete flexibility. For economy installation, a white only flash option is available. Those with a preference for a red flash have two options; a red only flash or red ChromaPlus, a unique innovation capitalising on the human perception of light, to give the impression of a red flash while providing a much higher coverage than a red-only flash. This reduces the number of devices required in an area and consequently reduces installation and system costs.

LX Range

The views of many customers have been incorporated with many ingenious techniques to provide practical solutions. Central to its design is the complete flexibility to alter the flash rate, coverage and flash colour at the click of a switch. These settings allow the products to meet the unique requirements of each specific area and manage power consumption in the most efficient manner.

Visit our new website at www.cooperfulleon.com to find out more about the LX range and access a variety of support tools. The resources section ensures all your questions are answered in one place. An informative pocket guide based on the Loss Prevention Code of Practice CoP 0001 is also available to download. This booklet provides guidance and recommendations on the planning, design, installation and commissioning of visual alarm devices. A video is also available, providing a useful overview on how Fulleon's LX range meets the requirements of the new standard.

Also improved and expanded is the information about Cooper Fulleon's range of technical support and services. This includes installation information, product manuals, details on our same-day despatch service (UK only) and access to the Cooper Customer Centre (C3). The latest news from both Cooper Fulleon and parent company Cooper Industries plc is now displayed on the home page, together with links to the websites of all other Cooper Industries divisions. IFP

For more information, go to www.cooperfulleon.com

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Firetrace's Contin the Middle East

The widespread adoption of Firetrace International's automatic fire detection and suppression systems has resulted in the company's solutions becoming the region's systems of choice for protecting a host of different type and size of mission-critical assets. Jim Dickinson, Regional Business Manager, Middle East, North Africa & Caspian, explains.

Recently, Firetrace tube-based systems have been installed to protect a host of business-critical micro-environments throughout the Middle East – school bus engine compartments, motor control cabinets, dockside crane engine compartments and electrical cabinets, portable generators on offshore rigs, server cabinets and sub-floor voids. Projects have been completed in Abu Dhabi, Dubai and Ras Al Khamiah in the UAE, Saudi Arabia, Egypt and Qatar.

Undoubtedly this success has, in part at least, been driven by the recent spate of fires across the region – including shopping mall fires in Qatar and Dubai – that has resulted in local authorities, such as civil defence, looking more closely at solution providers and insisting on international approved systems. Authorities across the region are also now placing greater importance on protecting their country's critical infrastructure. Additionally, forward-looking companies in the region have realised that business continuity and the protection of business-critical assets are essential drivers of success, and that Firetrace is a key element in achieving both objectives.

While Firetrace solutions have been prominent throughout the Middle East for several years, the forming of a dedicated Middle East operation, Firetrace International (Middle East) LLC, towards the end of 2010 undoubtedly also had a major impact on the market's accelerated take-up of the systems. By establishing a permanent presence in the region with dedicated sales, operational and technical resources, Firetrace International demonstrated its lasting commitment to the Middle East market. This was further boosted when the Middle East was chosen for the launching of the company's innovative full-room Firetrace Engineered Systems; a solution that complements its tube-based Firetrace solutions, which are now protecting in excess of 150,000 installations worldwide. These latest moves firmly established Firetrace International as the pre-eminent global provider of fire protection for core mission-critical assets, irrespective of the shape or size of the enclosure.

The result is that the order book now boasts current orders that include 800 Firetrace systems destined for Lusail – the planned new city in Qatar – and for various sites in Qatar protecting electrical

motor control cabinets for sewage and drainage plants. This is the largest single order ever placed with the company. A further 1,000 Firetrace systems are destined for a Saudi Bin Laden Group project. In addition, orders for the new Firetrace Engineered Systems have come from Saudi Arabia, Qatar and Pakistan.

New Project Round-Up

Firetrace International has been supplying Firetrace systems for the past three or four years for drainage and sewerage projects in Qatar, with the latest order bringing the likely 2012 total to 970. In this instance, the chosen suppression agent was DuPont FM-200. The same suppression agent was chosen for the Saudi Bin Laden Group project to protect essential motor control cabinets for the Holy Harem extension project in the holy city of Makkah. Al Gurg Fosrock opted for the same agent for Firetrace systems installed to protect its server cabinets and sub-floor voids.

However, not all of the recent Firetrace installations are safeguarding fixed installations. Firetrace International last year supplied several of its tube-based Firetrace systems to protect the engine compartments of Liebherr and Gottwald cranes at SAQR Port at Ras al Khaimah, following a costly and disruptive fire. The installations proved so effective and reliable that a further 20 systems have now been supplied for new Gottwald cranes at the port.

For these engine compartment applications, ABC dry chemical powder was identified as the most appropriate agent, as it is ideal for Class A, Class B and Class C (Class B in the USA) fires. Following discharge it leaves a residue that absorbs flammable liquids, helping to avoid re-ignition. However, the particles of powder are too large to penetrate engine air filters and so the exposed external engine surfaces will need only to

ued Success in

be cleaned after a system discharge, by wiping, vacuuming, or washing.

Similar Firetrace systems are protecting the engine compartments of Ashok Leyland-built school buses in Dubai, again using ABC dry powder as the appropriate suppression agent. The decision to install Firetrace systems was taken when a couple of years ago the Dubai authorities mandated that a fire suppression system must be fitted to all school buses in the emirate. The supply of these systems is now in its third or fourth year and 60 systems are expected to be installed this year.

Tube-Based Solution

But how does the tube-based Firetrace system achieve such success? In short, it is a combination of engineering ingenuity, reliability and effectiveness. Despite the large number of completed installations, there has never been a single instance where a properly installed and maintained Firetrace system has either failed to detect and suppress a real fire, or false alarmed. Every Firetrace system provides intrinsically safe, around-the-clock protection that requires no external power or human intervention.

Each system comprises a cylinder that contains the chosen suppression agent, which is attached to technically-advanced proprietary Firetrace Detection Tubing. This leak-resistant polymer tubing is a linear pneumatic heat and flame detector that consistently delivers the required temperature-sensitive detection and delivery characteristics. It can be routed throughout the enclosure being protected and when it is exposed to heat and radiant energy from a fire, the tubing ruptures and the suppression agent is instantly discharged. The fire is extinguished in seconds, precisely where it starts and before it has had time to take hold.

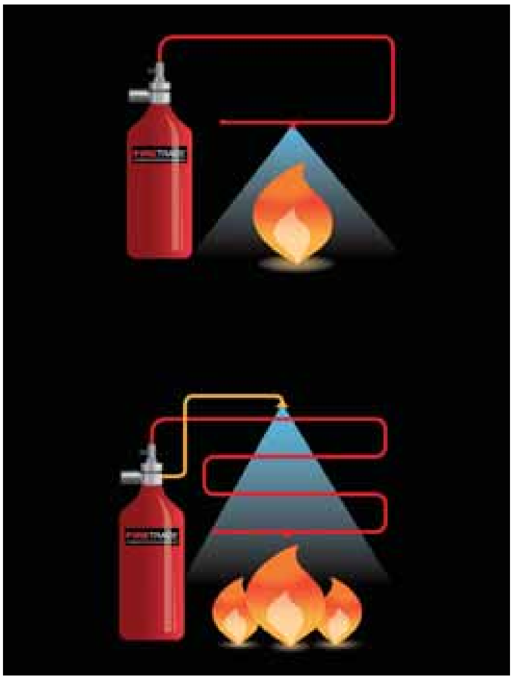
System Options

There are two Firetrace systems: the Firetrace Direct Low Pressure (DPL) system and the Firetrace Indirect Low Pressure (ILP) system. The DLP system utilises the Firetrace tubing as both the detection device and the suppressant delivery system. When the tubing detects a fire anywhere along its length it ruptures, forming an effective spray nozzle that automatically releases the entire contents of the cylinder.

The Firetrace ILP system uses the Firetrace tube as a detection and system activation device, but not for agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube. The agent is discharged immediately from the cylinder through diffuser nozzles, flooding the entire cabinet.

Full Room Protection

While remaining committed to the principle that the majority of business-critical assets are most cost efficiently and effectively safeguarded by providing them with dedicated in-cabinet protection, Firetrace International's Engineered System enables the company to provide customers around the



world with a single source of supply for mission-critical asset protection, whatever the shape or size of the area being protected. This recognises that there are some applications that may be best protected by a total flooding system.

End-users benefit from a much lower financial outlay when compared with similar systems on the market, significantly improved design freedom, and a swift, least-cost transition from an existing Halon system to the latest clean agent technology and delivery solution. When using 3M Novec 1230 Fire Protection Fluid as the suppression agent, the Firetrace Engineered System also offers the benefit of 500 psi (34.5 bar) high-pressure efficiency while utilising low pressure hardware, drastically slashing the amount of piping used.

Sustainable, Environmentally Sensitive Suppression

So, both the Firetrace in-cabinet systems and the new Engineered System provide an opportunity for end users to embrace sustainability and minimal environmental impact, thanks to the use of the latest clean agent technology – 3M Novec 1230 Fire Protection Fluid and DuPont FM-200. Both are non-corrosive and non-conductive agents that are listed in appropriate codes and standards such as NFPA 2001:2012 and BS EN 15004:2008.

Novec 1230, for example, exists as a liquid at room temperature. It is stored as a low-vapour-pressure fluid that, when discharged, transmutes into a colourless and odourless gas, using a concentration of the fluid that is well below the agent's saturation or condensation level. It has 20-year sustainability. It leaves no residue to clean-up after discharge, does not damage sensitive electronic equipment and is also completely safe for discharge in occupied areas. IFP

For more information, go to www.firetrace.com

Tackling False Alarms

Graham Simons

Fire Industry Association

Fire Industry Association

As you are aware, there are huge costs associated with false alarms. Estimates in the UK suggest that false alarm costs the country in excess of £1 billion. Although this is not a new issue, this year the Fire Industry Association put false alarms high on the agenda with the launch of its *"Cut False Alarms Costs!"* campaign.

CUT FALSE ALARM COSTS

Besides the cost to the Fire and Rescue Service's (FRS) resources, false alarms disrupt productivity during evacuations, not to mention the risk to life. With a loss of confidence in the fire alarm system, people may become complacent and not behave as they should in the event of a real fire. The fire service crew and the public are also at risk when they rush to the scene of a false alarm.

So how do we sort this out? The starting point is to realise that there is a problem and that sensible management of a building and the fire alarm system will lead to a solution.

Causes and Classification of False Alarms

Common causes of false alarms are:

- **Poor building management:** contractors undertaking work without the fire detection and alarm being disabled.
- **Poor fire system design:** a room used as a kitchen that has a smoke detector installed.
- **Poor maintenance:** a poorly maintained smoke detector has become over sensitive.

Incidents of false alarms are put into categories that should be recorded in a logbook. In the UK, *BS 5839-1) Fire detection and fire alarm systems for buildings. Code of practice for system design, installation, commissioning and maintenance)* recommends the following four categories:

- **Unwanted alarms:** burning toast or steam producing fire-like phenomena will activate a fire detector as a real fire.
- **Equipment false alarms:** alarms generated by faulty equipment.
- **Malicious false alarms:** deliberate breaking of a manual call point.
- **False alarms with good intent:** someone smelling smoke or sensing a possible fire.

Building Management

Those responsible for the fire alarm system have a duty to reduce false alarms. All incidents of false alarms should be investigated and recorded to establish the root cause. A target number of false alarms to not exceed should be set, but always with the aim to improve and drive false alarms down to zero. Recording all false alarm incidents helps identify their causes, which should be shared with staff so that they are aware of the problems and know how to avoid them. For example, if smoking is a problem, make sure that proper facilities are provided away from smoke detectors.

The building should be monitored for change of use and assess any effect this may have on the fire alarm system. Building work should be supervised, as it may be necessary to disable part of the fire alarm system and implement temporary alternative fire protection to avoid unnecessary alarm activation.

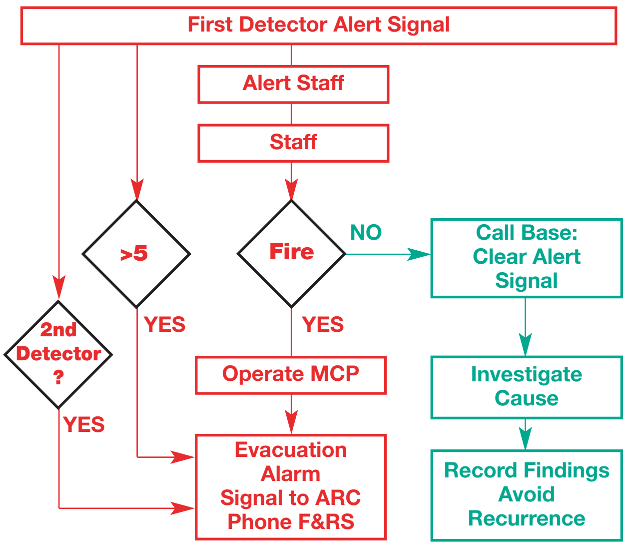
Fire Alarm System Design & Maintenance

A wide range of fire detection technology is available, but suitable detectors must be employed for each application. Heat detectors are normally used in kitchens to avoid false alarms but smoke detectors should be used in escape routes. Multi-sensors monitor several phenomena to give sensitive fire detection and reduce false alarms.

Various filtering techniques are available and may be suitable depending on the building risks:

- **Delay Alarms:** following first alert signal, delay fire alarm signals to allow staff investigation.
- **Coincidence detection:** first alert signal will not trigger a fire alarm signal until confirmation from a second detector.
- **Day/Night Mode:** change the operation during the day when people occupy the building; manual call points only, reduce sensitivity or disable smoke detection, enable delay for inspection.

Any filtering will delay the response of the fire alarm system and it is essential to consult with the system maintainer, insurer and local Fire and Rescue Services to ensure suitable protection. Competent companies must carry out routine maintenance to ensure that all equipment is operating as it should. IFP



Filtering Techniques flow chart

Graham Simons is Technical Manager at the Fire Industry Association

For further information, go to www.fia.uk.com/en/cut-false-alarm-costs

Keeping Up With Code Changes

NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems, 2012 Edition, is now available and contains significant changes and/or modifications that will impact the design and installation of clean agent systems supplied to Underwriters Laboratories Approvals and Factory Mutual standards. While a US-based organisation, NFPA standards are globally significant and are a point of reference to a large part of the international fire protection community.

After an in-depth review of the changes, Janus believes that the following most significantly impact the design, installation and/or testing of clean agent systems:

- 4.3.3.6.2. Operation of any manual control shall cause the complete system to operate as designed.

This section was modified for the sake of clarification. As an example, if the automatically operated system is designed to include the agent discharge, the operation of discharge controls, and the shutdown of equipment necessary for the successful system performance, then the same controls and shutdowns need to function as a result of the manual operation of the system.

- 5.3.5. Where a clean agent total flooding system is being provided for the protection of a room with a raised or sunken floor, the room and raised or sunken floor shall be simultaneously protected.
- 5.3.5.2. Each volume, room and raised or sunken floor to be protected, shall be provided with detectors, piping network, and nozzles.
- 5.4.2.4*. The minimum design concentration for a Class A surface-fire hazard shall be determined by the greater of the following:
  1. The extinguishing concentration, as determined in 5.4.2.2 (that is, a manufacturer's test), times a safety factor of 1.2
  2. Equal to the minimum extinguishing concentration for heptane as determined from 5.4.2.1 (that is, the cup burner values)
- 5.4.2.5. The minimum design concentration for a Class C hazard shall be the extinguishing concentration, as determined in 5.4.2.2 (That is, a manufacturer's test), times a safety factor of 1.35.
- 5.6*. Duration of Protection. A minimum concentration of 85 percent of the adjusted minimum design concentration shall be held at the highest level of combustibles for a minimum period of ten minutes or for a time period to allow for response by trained personnel.
- 5.6.1*. It is important that the adjusted minimum design concentration of agent not only shall be achieved but also shall be maintained for the specified period of time to allow effective emergency action by trained personnel.

The concept of providing 85 percent of the design concentration to be held at the highest level of combustibles for a minimum period of ten minutes was first introduced in the 2008 edition of NFPA 2001. The term "design concentration" was changed in the 2012 edition to be "adjusted minimum design concentration" which is defined in 3.3.9.1 as "Adjusted Minimum Design Concentration (AMDC). The target minimum design concentration after the safety factor and the design factors has been taken into account". The Janus Design Suite calculation program for both FM-200 and Novec 1230 Fluid requires that a design concentration be provided for each hazard enclosure that is being calculated. We term that input field as "Concentration Requested". This is the same as Adjusted Minimum Design Concentration (AMDC) as defined in NFPA 2001, 2012 Edition.

Note that upgrades are not necessarily applicable to installed systems covered by this standard but should be considered when designing new or upgrading existing installations.

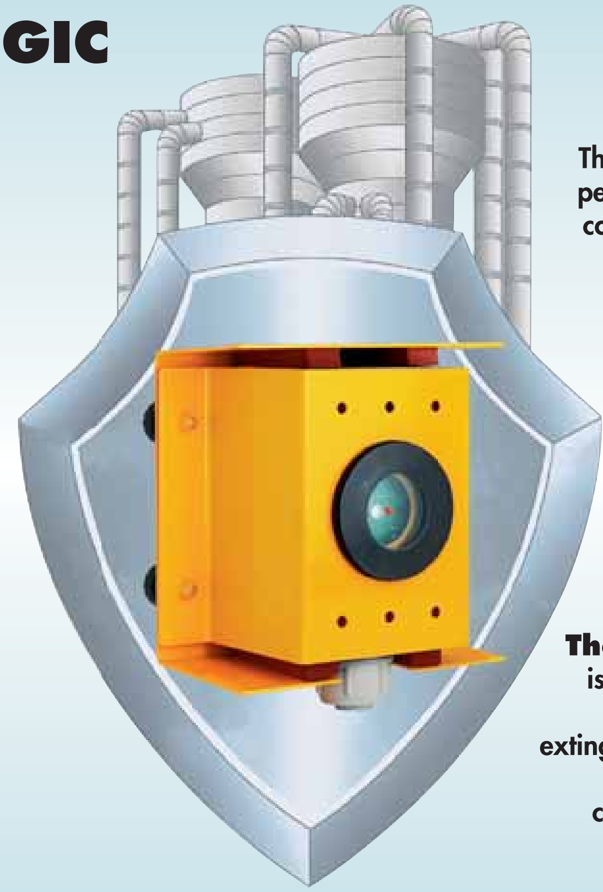
Keeping pace with the latest standards is difficult and clients have to rely on their manufacturers to diligently track updates. Janus Fire Systems consider it essential to arm customers with the latest information affecting system design because it is crucial to their businesses.

We have highlighted only a few points relevant to the clean agent systems manufactured by Janus Fire Systems. It is recommended that all parties review NFPA 2001, 2012 Edition, as well as clean agent system manufacturers' latest manuals and design software to ensure compliance. Some jurisdictions undertake a thorough review of the document prior to implementing changes to the latest edition of that standard. It is important to be proactive and prepare for the time when those changes are implemented. IFP

For more information, go to www.janusfiresystems.com

CONTROL LOGIC Spark detector

designed for dust collection systems to protect storage silos from the risk of fire.



Sparks fly at high speed.

They travel at a hundred kilometres per hour along the ducts of the dust collection system and reach the silo in less than three seconds

The CONTROL LOGIC SPARK DETECTOR is faster than the sparks themselves. It detects them with its highly sensitive infrared sensor, intercepts and extinguishes them in a flash. It needs no periodic inspection.

The CONTROL LOGIC system is designed for "total supervision". It verifies that sparks have been extinguished, gives prompt warning of any malfunction and, if needed, cuts off the duct and stops the fan.

ISO 9001

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CONTROL LOGIC s.r.l.

BETTER *TO KNOW* IT BEFORE

Eye is faster than nose.
In the event of live fire the IR FLAME DETECTOR responds immediately

CONTROL LOGIC IR FLAME DETECTOR

the fastest and most effective fire alarm device for industrial applications

IR FLAME DETECTOR RIV-601P/FA EXPLOSIONPROOF ENCLOSURE

For industrial applications indoors or outdoors where is a risk of explosion and where the explosionproof protection is required. One detector can monitor a vast area and responds immediately to the fire, yet of small size.

Also for RS485 two-wire serial line

IR FLAME DETECTOR RIV-601P/F WATERTIGHT IP 65 ENCLOSURE

For industrial applications indoors or outdoors where fire can spread out rapidly due to the presence of highly inflammable materials, and where vast premises need an optical detector with a great sensitivity and large field of view.

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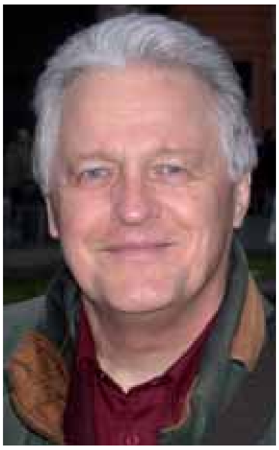

Graham Collins

What's New in Fire Alarm & Control Panels

Ever more sophisticated, reliable and versatile fire alarm and control panels are continuing to be developed, tested and launched around the world by the leading manufacturers. Here we take a brief look at what has recently come onto the market from a few of the industry's "movers and shakers".

Performance Packed Panels

KENTEC ELECTRONICS' new UL and FM approved Sigma A-XT releasing panel is being promoted as being packed with performance for all small-to-medium fixed firefighting installations, plus extensive configuration options for easy system modification. With three initiation circuits as standard, release can be configured to allow (among other combinations) any two from three type activations in configurations most often required for detection, such as ceiling void, room and floor void applications.

The large and readable LED display enables easy configuration and control, with the time remaining until release clearly displayed for added user safety. Releasing delays and releasing duration are configurable in five-second steps, with detection and sounder delays also configurable with comprehensive programming functions. In addition, the countdown timer can be duplicated on up to seven remote status units to provide local indication of the system status.

Other programmable options include use with I.S barriers, zero time delay upon manual release, non-latching zones to receive signals from other systems such as aspirating equipment or addressable modules and inversion of the low pressure switch input.

With all of the electronics mounted on a single, easily removable, steel plate, Sigma A-XT panels are both robust and easy to install. Sigma A-XT is supplied in an enclosure that matches the design and colour of the Elite RS range and is available in standard red or optional grey. With its simple-to-programme flexibility, Sigma A-XT has all the intelligent solutions needed to enable modern fire alarm systems to be engineered and installed, simply and efficiently.

For more information go to www.kentec.co.uk

Advanced Lifeline paging system

The latest development from ADVANCED ELECTRONICS is its Lifeline paging system, which combines three solutions in one box: a complete alert system that ensures that the hearing impaired are alerted to a fire alarm; an ESPA compatible, detailed fire paging solution that passes live information of fire system status to pagers; and a staff paging solution that allows pre-programmed messages to be delivered to users.

As a route to DDA (Disability Discrimination Act) compliance, Lifeline is being claimed to be the ideal off-the-shelf solution for end users and installers. It connects into any existing fire system via a relay, and alerts users on the premises of any fire alarm via personal pagers, bedside units and pillow vibrators.

For detailed fire paging, Lifeline uses ESPA to transmit live information from a compatible panel or network to nominated staff or groups, (up to 100 groups are available). Information can be as simple as, for example, "fire" or "fault" or be detailed down to information on specific networked panels and devices in alarm.

In its simplest mode of operation, Lifeline transmits pre-programmed messages via user-programmed buttons or when an input condition is met. Up to eight fire system inputs are available and each can transmit a specific message to a pager group. For example, staff can receive a different message

to general users, or alerts can be issued for events such as bomb warnings or hazards.

It uses a variable 2W UHF transmitter, delivering increased signal penetration that ensures optimal building coverage while allowing the signal to be adjusted to avoid overlap and to maintain power consumption at a minimum. Lifeline is mains powered with up to 72 hours emergency operation from batteries and offers continuous monitoring for system and pagers. It has key and code options for testing and engineering functions, a large back-lit LCD display and nine LED status indicators. It offers continued messaging (every ten seconds) while a fire indication is present and is simple to maintain for constant compliance.

Lifeline can be expanded to cover very complex paging requirements and used as a tool to improve the management of fire installations.

For more information go to www.advel.co.uk

Mimic Performance

The KENTEC ELECTRONICS Syncro Matrix is being spotlighted as a revolution in fire alarm mimic display technology that uses flexible, fibre-optic light guides to illuminate areas on a fire alarm mimic display floor plan. Uniquely flexible and future-proofed, it completely dispenses with wiring, enabling indicators to be moved, removed or added on site.

On this conventional version of the Sigma Matrix, all indicators can be configured to operate via switched positive or negative inputs providing compatibility with a wide range of input/output boards. This allows Sigma Matrix mimic displays to be designed and supplied to replace any existing mimic, when an update is required, regardless of fire alarm panel manufacturer.

The Sigma Matrix range is also available in a wide range of sizes to fit Kentec Sigma conventional panels, and in bespoke sizes to fit any make of fire alarm panel. It uses high quality, full-colour or monochrome floor plans, the zonal displays have a capability of up to 500 indicators, with standard enclosures capable of housing 24, 56 or 88 LEDs. All panels in the Matrix Mimic system are certified as compliant with EMC requirements.

For more information go to www.kentec.co.uk

Touchscreen Control

C-TEC has introduced a new range of two- to eight-loop touchscreen-controlled analogue addressable fire alarm panels. Costing over £1.5 million to develop and fully compliant with EN54 parts 2 and 4, the ZFP is said to represent a major breakthrough in fire alarm technology with its massive capability and flexible modular design.

With ten different programmable indicator and switch modules, eight different expansion ‘A-Bus’ PCBs and two stylish compact mini-repeaters (for plush reception areas), systems can be easily and quickly ‘built-up’ to suit any site, no matter how complex. The ZFP’s ‘Hi-Net’ high-integrity network can accommodate up to 128 nodes and up to 10,000 programmable and indicatable detection zones. Each panel possesses a 110mm full-colour touchscreen to provide constant feedback on all aspects of system activity.

As well as having access to a range of standard off-the-shelf ZFP panels, customers can select a ZFP configuration to exactly suit their requirements for larger, more complex projects. Three master cabinet sizes are available and all come with a control and display module, a two-loop main PCB and a 3A or 5A EN54 PSU. Depending on the application and cabinet size selected, additional indicator and switch modules can be added, together with other options such as additional loop drivers, a network card, one or more A-BUS PCBs, flush mounting bezels and more.

For more information go to www.c-tec.co.uk

Networkable Panels

All six of the C-TEC EN54 Parts 2 and 4 compliant XFP networkable analogue addressable fire alarm panels are LPCB (Loss Prevention Certification Board) third-party approved.

Offering what describes as: “high performance at a very competitive price”, the XFP range is said to be ideal for office blocks, shopping complexes and big industrial sites, as well as smaller, stand-alone applications.

Available as a single-loop 16-zone panel in a plastic enclosure or a robust one- or two-loop 32-zone metal panel, XFP panels offer an array of user and installer-friendly features, including full compatibility with Hochiki’s ESP and Apollo’s XP95, Discovery and Xplorer protocols, two independently programmable conventional sounder circuits and the ability to interconnect up to eight XFP main panels onto a two wire RS485 network. The XFP is also fully compatible with C-TEC’s new Hush Button fire alarm solution for houses of multiple occupation.

For more information go to www.c-tec.co.uk


APPROVED
FIRE ALARM CONTROL PANELS
CERTIFIED TO EN54-2/4
LVD, EMC, CPD COMPLIANT
AUTOMATIC EXTINGUISHER PANELS
CERTIFIED TO EN12094-1 & EN54-2/4
LVD, EMC, CPD COMPLIANT
12V & 24V POWER SUPPLIES
CERTIFIED TO EN54-4
LVD, EMC, CPD COMPLIANT
C-TEC is the only UK fire panel manufacturer with third-party product certifications and factory process approvals from the LPCB, BSI and VdS.
Currently trading in over 60 countries worldwide, our commitment to quality is underlined by our ISO 9001 accreditation (held since 1994) and our corporate membership of the Fire Industry Association (FIA).
When it comes to high-quality standards-compliant life safety equipment, you're safe with C-TEC
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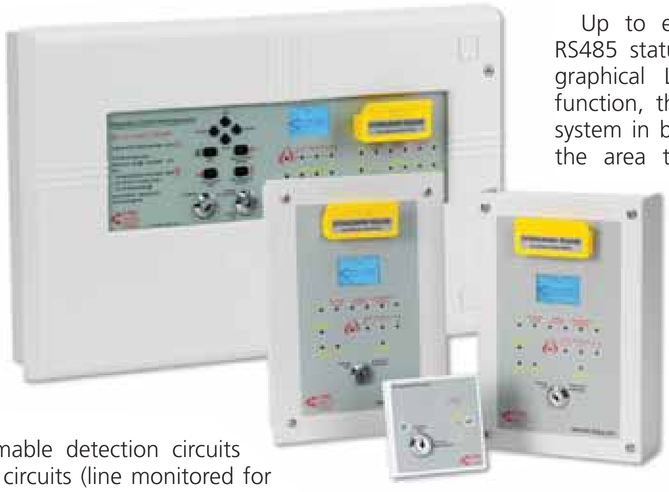
Automatic Extinguisher Panel



C-TEC's three-zone automatic extinguisher panel, the EP203, is third-party LPCB (Loss Prevention Certification Board) approved to EN54-parts 2 and 4, is fully compliant with EN12094 part 1, and has been specifically designed for areas housing expensive, dangerous or irreplaceable items such as computer servers, remote telecommunication outstations, unmanned chemical plants, computer rooms and any other area containing invaluable equipment,

The panel has three programmable detection circuits and three programmable sounder circuits (line monitored for open and short circuit faults). A 128×64 graphic LCD unit with two-colour back-light provides a user interface for presentation of information and interrogation of data held by the EP203. The panel also possesses adjustable extinguishant release output, delay and flood time.

Up to eight remote status units utilising RS485 status connections can be used. With graphical LCD display and manual release function, the units indicate the status of the system in buildings with multiple entrances to the area the panel is protecting. Economy status units are also available but without the LCD display and manual release function. An optional relay expansion unit, fitted in the main panel housing, can also be purchased for system expansion.

The panel has an impressive range of features including programmable relay outputs with volt-free changeover contacts, a time stamped log and a facility to delay the alarm sounders. An alarm counter records the number of times the panel has been in an alarm state.

For more information go to www.c-tec.co.uk

Synchronised Solution

The Syncro AS single- or two-loop analogue addressable fire control panel from the KENTEC ELECTRONICS's Syncro series is being heralded as offering easy-to-configure expandability. It supports open protocol communications, including Apollo, Argus Vega and Hochiki, and uses microprocessor-based electronics to provide a flexible control system with high reliability and integrity. It is aim at being an economically scalable solution for small-to-medium sized fire detection systems.

It connects seamlessly to up to 63 other Syncro AS, or Syncro multi-loop panels and repeaters via the fully fault tolerant and robust Syncro network. A dedicated serial communications bus is also available for connection of a range of I/O modules including a 16-channel general purpose I/O board, a six-way sounder board, an eight-way relay board and a four-zone conventional detector interface. The panel's RS232 serial interface port can be used to connect to a printer, computer-based graphics system, modem, pager or, via third-party interfaces to BMS systems.

The loop explorer configuration utility has been updated to include support for the Syncro AS providing the powerful cause and effect functionality familiar to Syncro multi-loop panel users.

The chassis can be completely dismantled by removing just two screws. The outer cover can also be detached by removing two hinge pins making first-fix installation simple and enabling the sensitive electronic parts to be stored safely for re-fitting at the commissioning stage.

For more information go to www.kentec.co.uk

Pearls of Wisdom

– new family of advanced control panels

NOTIFIER BY HONEYWELL is launching its new Pearl addressable fire panel alongside a range of intelligent loop-powered, audible visible (AV) evacuations devices.

The Pearl panel is the first in a new family of advanced control panels from Notifier by Honeywell. The new AV devices have been designed to integrate with the Pearl panel with the aim of reducing the total cost of installation and commissioning and enable a faster project turnaround.

All devices incorporate the Notifier Opal digital protocol allowing for up to 318 detectors and modules on each loop, all mechanically compatible with the latest B501AP base providing enhanced installation and reconfiguration flexibility, which is suitable for both flush and surface mounting. The Opal protocol interface also enables sounder volumes and tones to be changed from the panel and provides independent control of both devices in combined units.

For more information go to www.notifier.com

When asset protection matters most. DuPont™ FM-200®.

DuPont™ FM-200® clean agent can reach extinguishing levels in 10 seconds or less, stopping ordinary combustible, electrical, and flammable liquid fires before they cause significant damage. When fire is extinguished that quickly, it means less damage, lower repair costs, and an extra margin of safety for employees and valuable assets—making it easier to keep your business running smoothly.

Make sure your business is protected with the most widely specified clean agent in the world. Get maximum protection with DuPont™ FM-200®.

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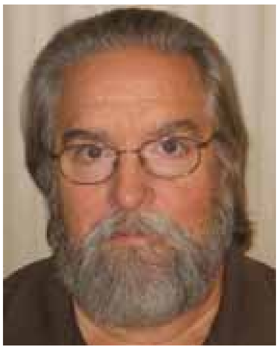
DuPont Fire Extinguishants. The Science of Protection.™

The miracles of science™

Aftermath of pre-action sprinkler activation on an in-cabinet fire

Business Continuity and Clean Extinguishing Agents



Mark L Robin

DuPont Chemicals & Fluoroproducts

Modern data centres and telecommunications facilities house a vast array of expensive and sensitive electronic devices connected together and configured to analyse, collect, distribute, manage and store information. They are vital to business continuity and their protection needs careful thought.

Typical electronic equipment found in IT facilities includes computers, servers, local area networks (LANs), magnetic tape libraries, converters, routers, switches, storage area networks (SANs), direct access storage devices (DASDs), and support equipment such as power distribution units (PDUs), uninterruptible power supplies (UPSs), and computer room air-conditioning (CRAC) units. Telecommunication facilities, like IT facilities, are characterised by spaces filled with ever-increasing numbers of server racks and are regarded as mission-critical facilities.

The IT and telecommunications industries continue to experience rapid growth. It has been estimated that there are approximately 75,000 major data centres in the United States alone, housing corporate, governmental and military operations; globally, the number of data centres likely extends into the hundreds of thousands.

In the matter of a few years, telecommunications has progressed from an industry involving a single service, standard telephone service, to one that affects numerous facets of our daily life, and includes not only standard telephone service, but also wireless communications, automatic teller machines (ATMs), teleconferencing services, video conferencing services, point of sale transaction terminals, electronic funds transfer, cable TV and Internet access.

The Need for Business Continuity

Data centres and telecommunication facilities also share a vital characteristic: both have evolved into mission-critical facilities requiring business continuity

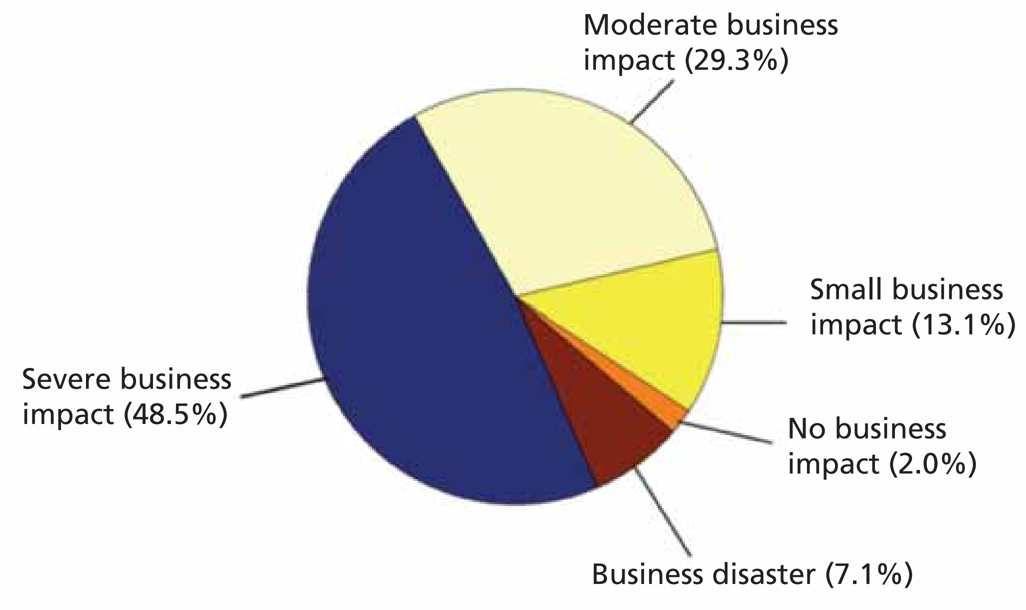


Figure 1. Business Impact of a One Hour Outage for Mission Critical Applications. (Source: IDC, Mission-Critical Workloads Study, 2011)

on a 24×365 basis. There was a time when temporary business interruptions were a minor and relatively inexpensive inconvenience to the operation of IT and telecommunication facilities. However, with modern society's reliance on the interconnected global IT infrastructure for much of what we consider everyday life, the loss of IT/telecommunications service can have a dramatic effect that extends well beyond the affected business, negatively impacting clients, suppliers, whole industries, and society at large.

Service interruption is a major concern in telecommunication facilities due to the unique nature of the information processing performed in such facilities. Telecommunication systems switch and transport data to and from a vast selection of users in real-time. In the event of a system failure, all information in transit is lost. This contrasts with the case of data processing centres, where data is stored in the systems memory, and during an interruption only that data that has not yet been placed in permanent memory is lost. Many modern data centres are multi-user in nature, and as a result, a single service interruption, such as a fire, can lead to losses for a large number of enterprises.

The uninterrupted use of computers and electronic equipment in IT and telecommunications facilities is critical. In the recent IDC publication: "*Mission-Critical Workloads Study*" a number of business sectors reported that even a one hour loss of business continuity can have a dramatic impact (see Figure 1). Almost half of respondents reported that one hour of outage would have a "severe business impact" and 7.1 percent reported that it would represent a "business disaster."

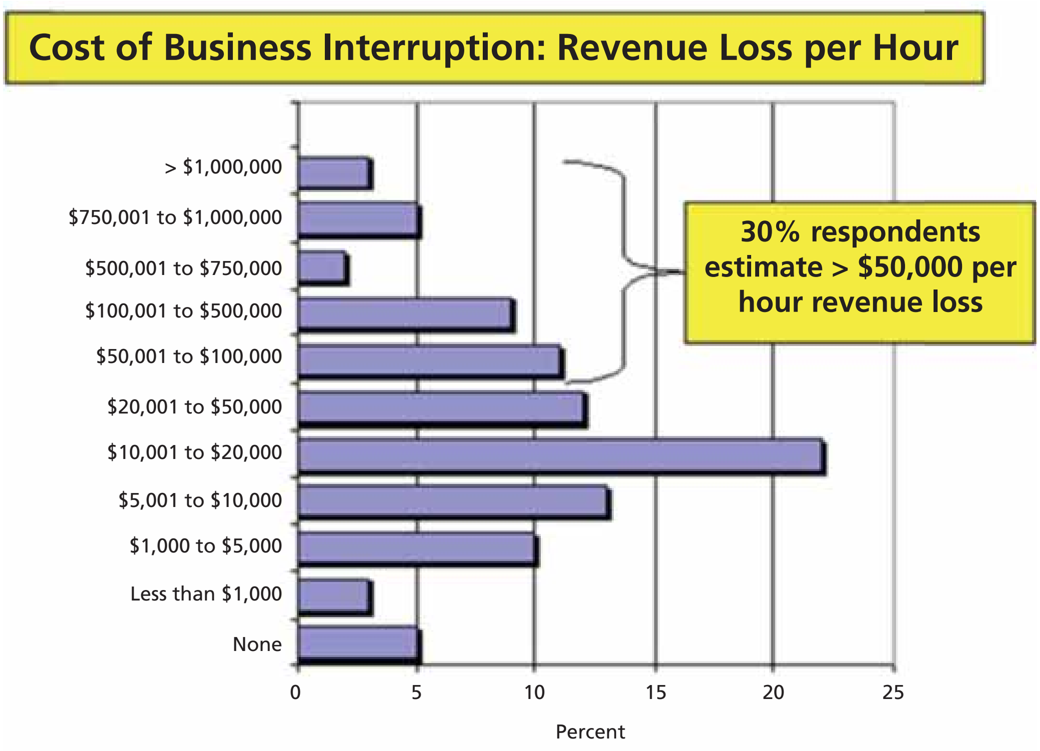


Figure 2. Revenue Loss per Hour. (Source: Ponemon Institute, 2010)

Table 1. Revenue and Productivity Losses by Business Sector

Business Sector	Revenue Loss per Hour	Productivity Loss per Hour
Financial	$9,997,500	$3,640
Retail	$397,500	$2,580
Healthcare	$157,500	$1,250
Manufacturing	$59,930	$3,060
Public Sector	$0	$850

Source: IDC Business Value Research, 2009-2011

The financial impact of a service disruption can be significant. A recent Ponemon Institute survey on data centre outages estimated that the revenue lost during a one-hour business interruption would exceed $50,000 for a third of the businesses surveyed and, in some cases, losses were estimated by respondents to be in excess of $1 million (see Figure 2). For data processing facilities, the loss of data due to a fire can have devastating results. In addition to the problems associated with the loss of the data itself, for many types of businesses, new US federal regulations require that organisations ensure that their data is current, accessible and searchable at all times. Therefore, a data centre that has been damaged by fire may be unable to provide access to important information, putting it in violation of federal regulations and resulting in potential lawsuits, costly audits, and fines.

The need for business continuity is not limited to the IT and telecommunication industries. Countless processes and systems are now controlled by computers, including semiconductor fabrication, precision machining, and petrochemical and steel-making processes.

While the cost of downtime in data centres is high, revenue losses due to an interruption of business continuity in various business sectors can be staggering (see Table 1). According to the IDC Business Value data, the financial services sector experiences the greatest impact per hour of business interruption – nearly $10 million revenue loss and $3,640 in productivity loss per hour.

It is Not Just the Money

The total cost of downtime is not limited to revenue losses, but can ultimately include:

- **Productivity Losses**. Numerous users across an organisation rely on IT-delivered services and applications and any downtime will greatly reduce their productivity, often resulting in work grinding to a halt.
- **Customer Disruption**. Customers can suffer from disruptions in customer service and support systems, leading to dissatisfied customers that may take their business elsewhere.
- **Reputation Damage**. Disruptions can negatively impact the reputation of the organisation, leading to a loss in future sales.
- **Isolation and Repair Costs**. The costs to find and fix the problem.
- **Loss of Data and Records**.
- **Lawsuits**.

Costs in addition to the loss of revenue can be significant, as seen in Figure 3, which summarises the cost of a business interruption for a typical data centre outage of one hour.

Fire Protection Options

The high value and sensitivity of the electronic equipment found in modern data centres and

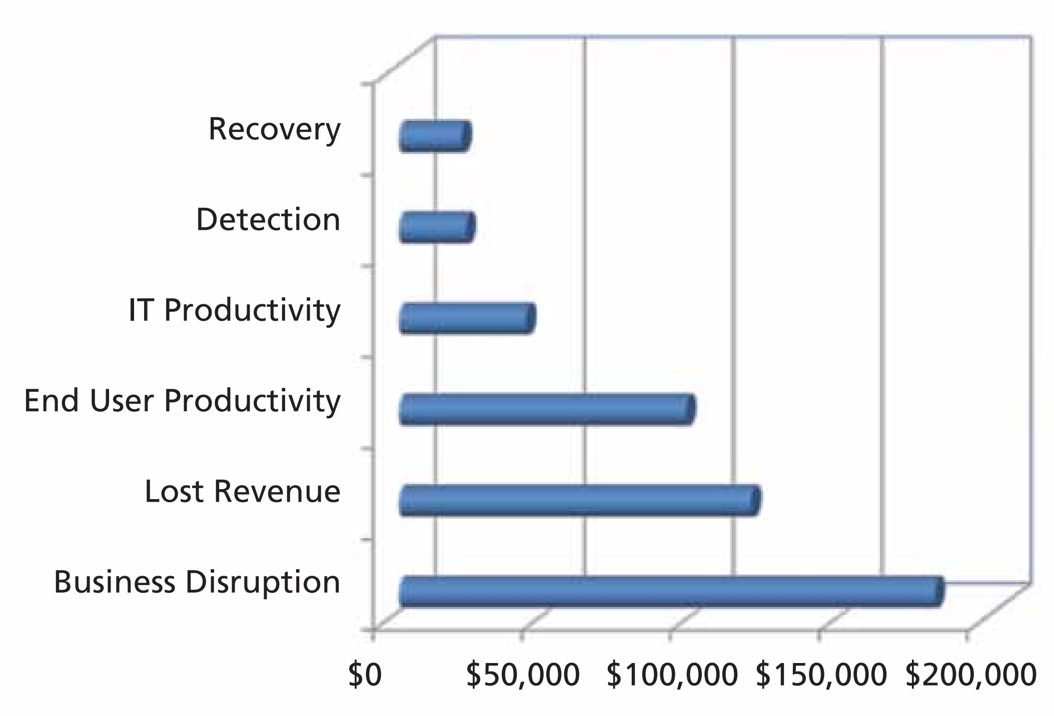


Figure 3. Cost of Downtime. (Source: IDC Business Value Research, 2009-2011)

Table 2. Datacenter Fires

Date	Location	Datacenter
10/10/2011	Mahwah, NJ	NYSE fire
12/28/2011	Mumbai, India	Aritel
6/15/2012	Scotland	Scottish Borders
6/22/2012	Mumbai, India	Mumbai Mantralaya
6/29/2012	Ames, Iowa	Iowa State University
7/6/2012	Calgary, Canada	Shaw Data Center

telecommunication facilities, combined with the consequences of system interruption, makes fire protection a critical component of any data centre/telecommunication risk assessment. Contrary to popular belief, fires do occur in these types of facilities as evidenced in Table 2, which includes a selection of data centre fires reported within the last year.

Water Based Fire Suppression Systems

The primary objective of a sprinkler system, whether wet-pipe or pre-action, is not fire extinguishment but fire control*:* confining a fire to its point of origin and controlling ceiling temperatures to prevent structural damage and fire spread. Sprinkler systems use water, typically at a delivery rate of 95 litres-a-minute or higher, which has obvious disadvantages around electronics and electrical systems.

In the event of activation, water damage to the facility and equipment can be substantial, often worse than the fire damage itself, and the clean-up required after sprinkler system activation can be extensive. Sprinkler heads are activated by a thermally sensitive frangible bulb or fusible link that releases water only after the head reaches a pre-set minimum, temperature, usually 57°C. By this time fires are well-developed and considerable direct fire, smoke, and water related damage can be expected. The extensive clean-up after a sprinkler system discharge, and resulting business interruption, will add to the business cost of a fire. For these reasons sprinkler systems are best suited for the protection of structures*,* not for the protection of critical assets located within those structures.

Water mist systems are a more recent entrant into the water-based fire suppression arena. Such systems generally require high pressure pumps and special nozzles to distribute a fine water mist into the protected space. Typical delivery rates for water mist systems are on the order of 30 litres-a-minute for high pressure systems.

Water mist primarily extinguishes via oxygen dilution: steam produced from the mist near the fire displaces oxygen and puts out the fire. Water mist systems perform well on large energetic fires, but have exhibited poor performance on small fires. Water mist, like water, does not fully flood a three-dimensional space and as a result is not suitable for the extinguishment of hidden or obstructed fires, such as an in-cabinet or in-rack fires. Like sprinklers, these systems leave residual water following system discharge, necessitating clean-up and added service interruption. Potential water damage to electronics and the incompatibility of water and electricity remain a real concern. For these reasons water mist systems, like sprinkler systems, are not recommended for the protection of high value electronic assets and services located within a structure.

Clean Agents

The primary objective of a gaseous clean agent system is rapid fire extinguishment. This limits fire damage to the object(s) involved in the origin of the fire and provides protection of the valuable and/or sensitive assets located within the enclosure. This is clearly fundamentally different from the primary objective of sprinkler systems.

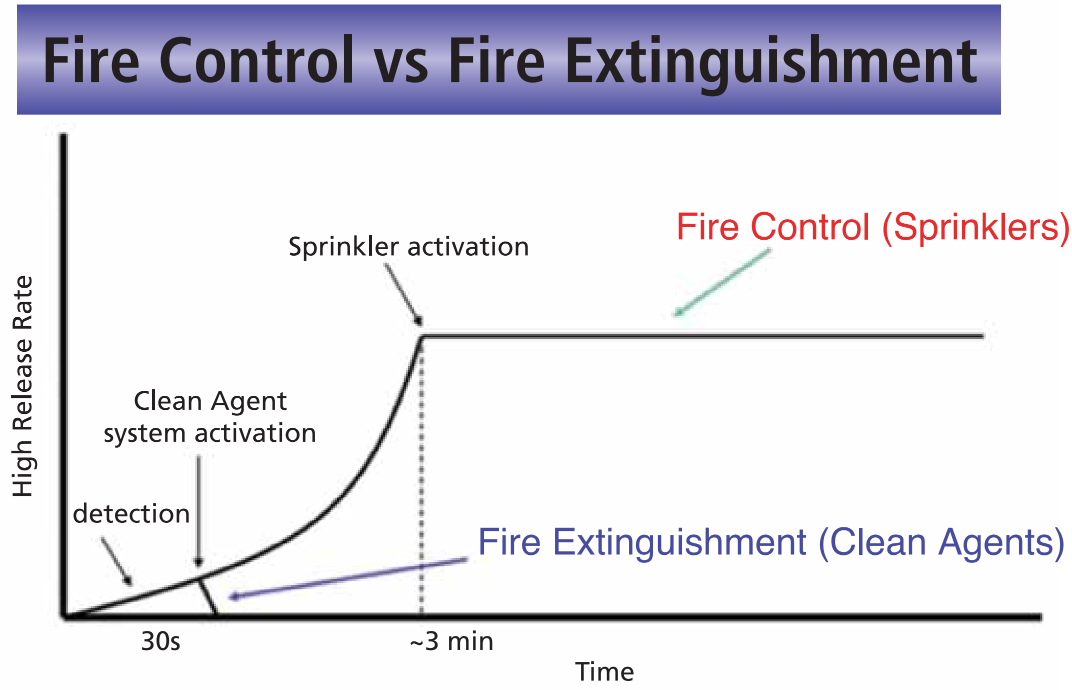
The primary advantages of total flooding clean agents are:

- Clean extinguishment – fires are extinguished without collateral damage due to agent discharge (no residues, no clean-up required).
- Rapid extinguishment during early stages of fire growth
- Ability to extinguish shielded, obstructed or three-dimensional fires in complex geometries.
- Clean agent systems employ a combination of rapid detection and rapid agent discharge, providing extinguishment of fires in their incipient stage, thereby significantly reducing asset damage due to thermal effects or fire combustion products, and allowing facilities to quickly return to service after a fire event.

Furthermore, clean agents do not leave corrosive or abrasive residues following their use, eliminating the cost and need for clean-up as well as the potential for longer term equipment operational issues. A gaseous clean agent penetrates into hidden or obscured areas and densely packed cabinets and racks. Consequently clean agent systems are ideally suited as the first line of defence to protect electronic equipment in mission critical facilities.

Clean agents can be divided into two classes: halocarbon agents, based on the elements of carbon, hydrogen, and halogen (for example, fluorine) and inert gas agents, based on gases such as nitrogen, argon and carbon dioxide. The two most widely employed total flooding clean agent systems for information technology and telecommunication facilities are DuPont FM-200 and Tyco Inergen systems. Systems using FM-200 employ HFC-227ea (CF_3CHFCF_3) and extinguish fire primarily through the absorption of heat. Inergen, a blend of nitrogen, argon and carbon dioxide, extinguishes fire by lowering the oxygen content to below the level required for sustained combustion. Both agents are electrically

Figure 5. Fire Control vs Fire Extinguishment



non-conductive, suitable for the protection of Class A, B and C hazards, and applicable for use in normally occupied areas. Both agents offer optimal safety in use as they are characterised by low chemical reactivity, high material compatibility and low toxicity (neither agent is metabolised in the body).

- **The Minimalist Approach to Protection of Critical Assets**

In an effort to reduce costs, some facilities choose to provide no fire protection for the mission-critical equipment within their facilities, opting only for the installation of sprinkler systems. As discussed above, these systems are designed to protect the overall structure, not the mission critical assets within the structure. Once a sprinkler system has activated, significant water damage is likely and the resultant business interruption may extend into weeks if not months. Another minimalist approach to fire protection in mission-critical facilities is to install sprinklers for the protection of the structure and high sensitivity smoke detectors (HSSDs) for asset protection, the theory being that once detected, someone can then find the fire and extinguish it with a handheld extinguisher. This approach requires 24/7 manning of the facility, and failure on the part of the operator to find and extinguish the fire will obviously lead to disastrous results for the assets in the facility following the activation of the sprinkler system.

The potential consequences of adopting a minimalist approach to fire protection can be clearly seen in the results of the recent Shaw outage in Calgary, Canada, in which the fire suppression system consisted of the minimum protection required by code – that is, a sprinkler system:

- Knockout out of the primary and backup systems supporting key public services.
- Crippled city services, including 311 emergency services.
- Delay of hundreds of surgeries at local hospitals.
- IBM Canada forced to fly back-up tapes holding vehicle and property registration data to a facility in Markham, Ontario.
- Extensive water damage to furniture, walls and sensitive electronic equipment on the floors below the top-storey fire location.
- Temporary relocation of over 900 Shaw employees while damage is repaired.
- Six days of service outage.

According to media reports, an electrical fire triggered the facility's water sprinkler system, which ran for more than two hours soaking furniture, walls and sensitive electronic equipment on floors below. The total cost of the incident is not limited to the costs associated with the above items, but will ultimately include costs due to loss of data and records, lawsuits and the loss of customer confidence.

Ensuring Business Continuity

To ensure business continuity in mission-critical facilities, fire protection of both the structure and its valuable and mission-critical contents is required. The added cost of installing a clean agent system is justified by its ability to provide what sprinkler systems cannot – protection of the sensitive, expensive and mission-critical assets located within the facility and the minimisation of business interruption and down-time in the event of a fire.

As demonstrated by the recent fire in the Shaw facility in Calgary, opting for minimal fire protection of such critical facilities can have devastating results. Sprinkler systems and clean agent systems are fundamentally different in their purpose: sprinkler systems serve to protect the structure, whereas clean agent systems serve to protect the contents of the structure. Substantial additional risk reduction at very high benefit/cost ratios may be realised by protecting sensitive, valuable and mission-critical assets, such as those found in IT and telecommunications facilities, with both a clean agent system and a sprinkler system. IFP

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Understanding the Firestopping: Part

Figures 1 and 2. A properly protected head-of-wall joint

Christopher DeMarco

Specified Technologies

In the previous edition of *International Fire Protection* we learned that a fundamental fire protection strategy is to divide a building into fire-rated compartments intended to contain fire to the compartment of origin. When openings are created in the walls and floors forming the compartments, their fire rating and ability to resist smoke migration is compromised. Often, openings cannot be avoided, in the case of penetrants or when barriers intersect.

This article is Part Two of a three-part series, with Part Three appearing in the next edition of *International Fire Protection*. In Part One, we defined fire-stopping as: "the process of installing third-party tested and listed materials into openings in fire-rated barriers to restore fire-resistance ratings" and talked about through-penetration fire-stops (mostly mechanical, electrical and plumbing applications). In this article, we will look at construction joints and perimeter fire barriers (curtain walls). In the next article, we will look at fire-stopping data cables (a huge source of life-safety violations due to the frequent changes they require) and healthcare and industrial applications.

Parts of a Fire-stop System

Construction joints are gaps in or between barriers. Sometimes they are the result of connections or intersections; other times, they are purposely introduced to allow movement. Common joint conditions include floor-to-floor, floor-to-wall, wall-to-wall, top-of-wall (the head-of-wall), or bottom-of-wall. Joints must be fire-stopped to prevent the spread of fire, smoke, and hot gasses. Figures 1 & 2 show a properly protected head-of-wall joint.

A joint system consists of both the barriers that form the joint boundaries, and the fire-stop products installed into the joint. The complete assemblage of elements, or system, achieves the rating, not the fire-stop product itself.

Tests for Construction Joint Fire-stop Systems

In areas of the world that have standardised on NFPA or ICC codes, the standards used to evaluate construction joint fire-stop systems are ASTM E 1966, entitled *Standard Test Method for Fire-Resistive Joint Systems,* or UL 2079, entitled *Tests for Fire Resistance of Building Joint Systems.* These standards are virtually synonymous and thus interchangeable. In Europe, the standard is EN 1366, although individual countries may have their own

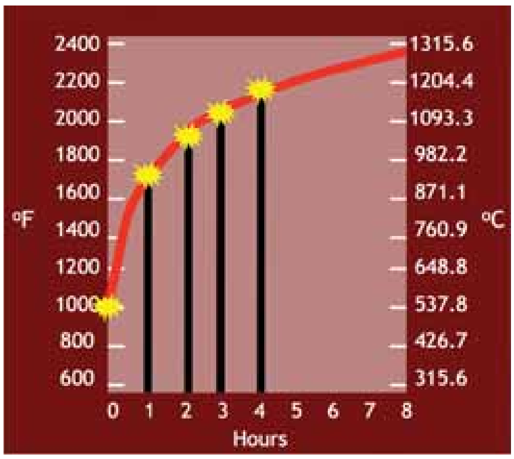

Figure 3. ASTM E1966 standardised time-temperature curve

Basics of Two

legacy standards such as BS 476 in the UK or DIN 4102 in Germany.

ASTM E1966 (UL 2079) exposes the test specimen to a standardised time-temperature curve, which assures all systems are tested in a consistent manner to the same rigorous requirements. This curve is shown in Figure 3.

Ratings

The fire-rating derived from ASTM E1966 (UL2079) is called an Assembly Rating. Expressed in hours, it is the time period the joint system resisted both flame passage and temperature rise. Temperature rise is measured by thermocouples, and the standards impose a maximum single point rise of 181°C over the initial starting temperature.

Figure 4 shows a typical head-of-wall joint system between a gypsum wall and steel deck floor being tested. The specimen is positioned on the furnace and exposed to fire. Failure occurs by observing flaming on the unexposed surface, or by excessive temperature rise.

Figure 4. Head-of-wall fire-stop system on test furnace

Immediately following fire exposure, the assembly is subjected to the impact, erosion, and cooling effects of a water hose stream test. The blast of high-pressure, cold water distresses the assembly by both the force and the thermal shock of rapid cooling. The pressure and duration varies according to the hourly rating tested. The hose stream is considered an excellent measure of system integrity, and provides an added safety margin to building occupants and fire-fighting personnel.

The fire exposure dictated by EN1366 (and other European standards) is somewhat similar to that of ASTM E1966 (UL2079) although the

Figure 5. Hose stream test

derived ratings use different terminology. A major difference is that European standards only evaluate fire exposure and do not include a hose stream. Designers, inspectors, and installers should be aware of the differences since systems tested to EN1366 need not be as robust as those tested to ASTM E1966 (UL2079).

Some joint systems are subjected to cyclic movement prior to the fire test to evaluate the ability of the system to accommodate movement due to thermal expansion, wind-sway, or even seismic conditions. Movement testing has the effect of fatiguing the joint sealant prior to fire exposure, and may affect the performance of the system under fire exposure conditions. A movement cycle consists of extending the joint and compressing it at a prescribed rate, as tabulated below.

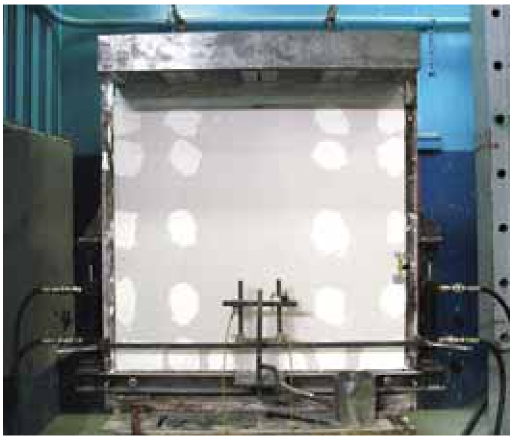

Figure 6. Cyclic movement test of head-of-wall fire-stop system

Movement Class	Number of Cycles	Cycles Per Minute (CPM)
1 (Thermal)	500	1
2 (Windsway)	500	10
3 (Seismic)	100	30
Combined test for all three categories consists of 400 cycles @ 10 CPM followed by 100 cycles @ 30 CPM		

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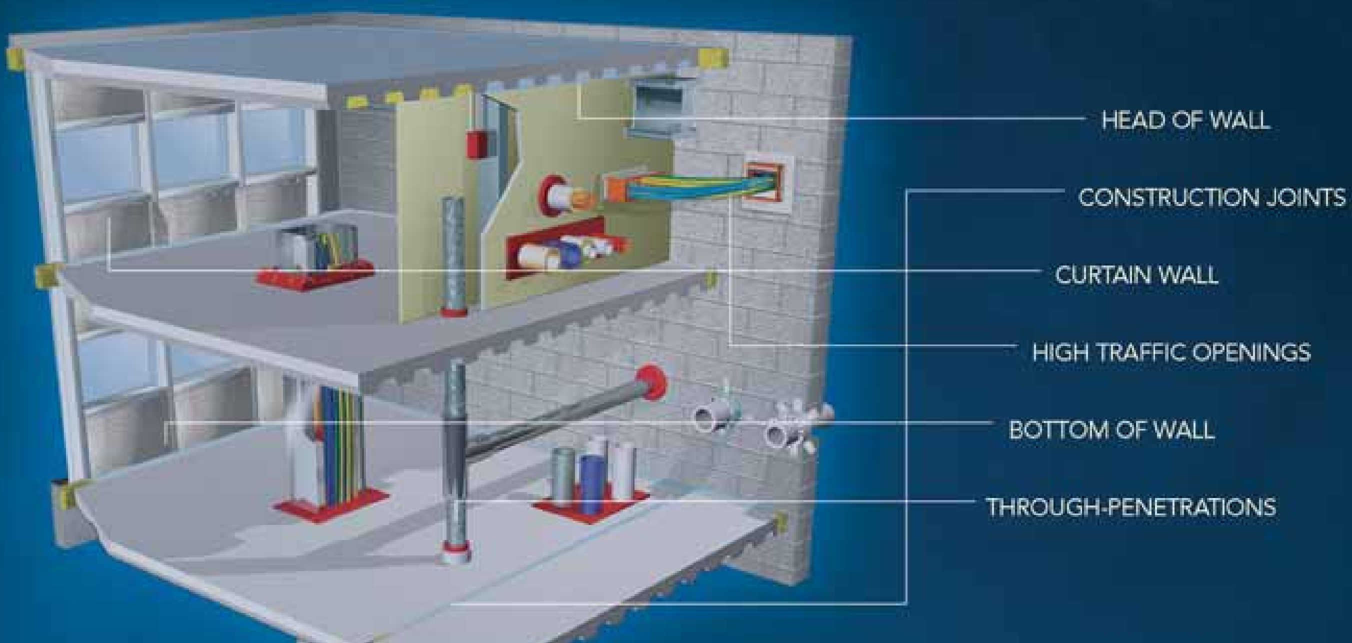

L & W Ratings

UL2079 includes optional test protocols for evaluating air leakage (L Rating) and short term water-tightness (W Rating).

For air leakage, the specimen is secured to a pressurised chamber that measures the rate of airflow through the system. The L Rating is often used as an indication of smoke resistance. It also helps a designer select the best system for controlling migration of particulate matter, such as tobacco smoke in office buildings or infectious/duct in hospitals.

Water-tightness is evaluated by placing a water vessel on top of the fire-stop system. The vessel is filled to a 914mm water column (or equivalent pressure) and exposed for 72 hours. A Class 1 W Rating requires the fire-stop system to resist the passage of water for the exposure period of 72 hours. W-Rated systems offer performance information for environments that may be subject to transient water exposure, such as some mechanical rooms or wash-down areas.

Figures 7 (top) and 8. The outside flame at 15 minutes and 45 minutes into a curtain wall test using the ISMA

Tests for Perimeter Fire Barrier Systems

A perimeter fire barrier system (PFBS) describes the fire-stop system installed into the linear opening between a fire-rated floor and a non-rated exterior wall (curtain wall). A PFBS evaluates the ability of the system to resist interior propagation of fire through the gap between floor and exterior wall for a time period equal to the floor. The correct test standard used to evaluate PFBS is ASTM E2307, entitled, *Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-Story Test Apparatus*.

ASTM E2307, referenced in both NFPA and ICC codes, is the most developed standard for evaluating these critical intersections. There is presently no equivalent to it. In fact, many countries that do not generally use ASTM standards have informally accepted the use of PFBS evaluated according to ASTM E2307. The use of these systems is necessary to ensure that continuity of the floor assembly is maintained from one exterior side of the building to the other. In addition, gaps often are made to accommodate the mounting hardware that secures the exterior wall to the edge of the floor. Left unprotected, the mounting hardware can fail and the building can shed panels, an extremely dangerous condition during occupant egress and firefighter ingress. An effective PFBS will therefore also protect the curtain wall mounting hardware from direct fire exposure.

ASTM E2307 uses a special test structure called the Intermediate-Scale, Multi-Story Test Apparatus. The ISMA structure simulates fire exposure in a high-rise structure where, as the fire intensifies and positive pressure builds, a fire induced window break occurs, thereby allowing oxygen to feed the fire. The flame plume erupts out of the broken windows and begins to attack the exterior of the curtain wall. By subjecting the PFBS to fire from two sides simultaneously, this two-story structure dramatically erodes critical wall framing elements that help keep the system in place for the full duration of fire exposure.

Many exterior walls integrate materials with sub-par fire resistance. Common wall types include glass, aluminium, thin stone veneers, or combustible core insulation panels. Typically, such products will not survive fire exposure. In fire exposure experiments, glass panels break in five to 15 minutes. Aluminium melts at 660ºC, a temperature reached within minutes in a big fire. Panel systems with polystyrene or polyurethane foams burn readily. Even inorganic materials with excellent fire retardant properties such as stone panels will fail prematurely. Trapped moisture can cause explosive spalling, while differential expansion can lead to cracking.

Therefore, a properly designed PFBS per ASTM E2307 must use high-melt point insulations or gypsum board installed in a different manner than the one the industry traditionally used, in order to protect the curtain wall and/or stay intact long enough to allow the fire-stop system in the safing gap to survive for a time period equal to that of the floor - generally two hours.

Properly designed and installed PFBS are pretty consistent. The spandrel area at the floor line is protected with heavy density mineral wool panels or gypsum board. The safing gap is filled with light density but compressed mineral wool batt insulation. A fire-stop coating or sealant is applied on top of the mineral wool safing insulation to complete the system. The fire-stop coating is the glue that holds the system together, reduces temperature transmission through it, and, perhaps more importantly, prevents smoke passage from floor-to-floor.

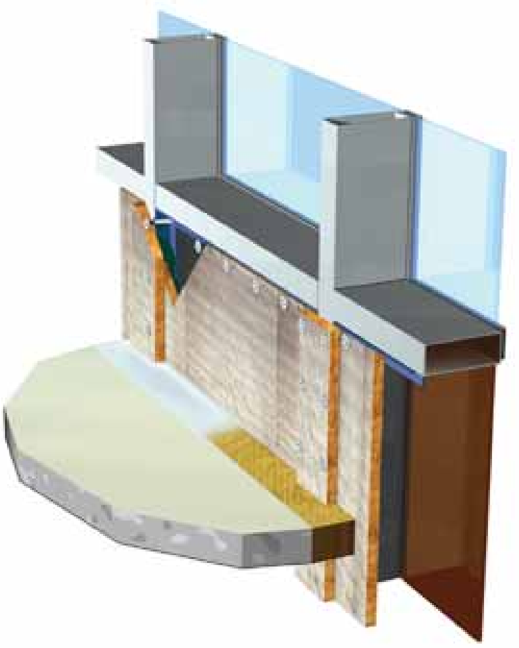

Figure 9. Correct manner to fire-stop a curtain wall/floor intersection per ASTM E2307

Smoke passage in these conditions can be exacerbated by the stack effect in high-rise construction, which is the natural flow of air that occurs due to temperature differentials between the conditioned air inside the building and the temperature outside the building. L and W Ratings can also be evaluated for PFBS by laboratories such as UL. Flexible coatings with enhanced water resistance are ideally suited to situations where portions of the exterior wall are yet to be installed, and threat of inclement weather is possible. The use of a steel plate underneath the safing gap is no longer required or desired with such a design.

Summary

Joint systems and perimeter fire barrier systems are important elements for designers, installers, and inspectors. Selecting the right products and systems begins by understanding the nuances of the ratings reported on labels and manufacturer's literature. The key to regulatory compliance and life safety is proper installation. Reading the systems, consulting with the manufacturer's qualified technical staff, working with experienced designers and contractors, and planning the work ahead of time makes the process easier.

In the next article in *International Fire Protection* we will be discussing two other items. High traffic openings (typically data cables) are a major headache for IT personnel, as they require constant changes and the number-one source of life safety violations for most buildings as walls are turned into Swiss cheese. The needs of healthcare and industrial facilities have also changed over time, yet many of the solutions they use are antiquated. But there are better ways of addressing both challenges. IFP

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For further information, go to www.stifirestop.com

Hotel Fire Detecti

Peter Lackey

ADT Fire & Security

Whether it is a large, international five-star hotel or a small boutique bed-and breakfast, having an effective fire detection and alarm system in place is absolutely crucial for the safety of staff and guests.

No matter what size or scale they might be, all hotel facilities should be viewed as high-risk buildings when it comes to implementing an effective fire detection system. This is because it is an establishment with members of the public coming and going 24 hours a day, 365 days a year. In addition to that, any building that incorporates sleeping accommodation means that you are dealing with a high level of vulnerability.

When you stop to consider the reality of a fire breaking out in a hotel, then for specifiers, fire and safety officers or anyone responsible for the safety of guests within a hotel, there is simply no room for complacency. It is vital to take every possible precaution against the potentially catastrophic effects of a fire.

This means implementing and managing a fire detection and alarm system that is appropriate to the level of risk. Therefore, the first step in the process is to identify any potential fire hazards within the premises themselves and although every facility will be different, there are some risks that will be common to all.

For example, although an increasing number of countries have banned smoking, internationally, some establishments do allow guests to purchase smoking bedrooms or have smoking rooms inside the hotel. Carelessly discarded cigarettes remain one of the main causes of fires. These can often take a long time to ignite, which means should it eventually cause a fire, there is a much higher risk that this will occur within sleeping hours.

Electrical appliances are a standard provision in bedrooms and can be a potential source of fire if they have been subjected to misuse, and occasionally electrical faults can occur if they have not been serviced regularly. Kitchens are also high risk, particularly if they are not properly supervised. Areas where cleaning products and linen are kept can also pose a risk, due to the presence of flammable materials and chemical cleaners.

Once any potential fire hazards have been identified, and removed or reduced, wherever possible the next step for those specifying a fire detection system is to consider the people using the facility – particularly those who may be deemed particularly at risk.

When a fire occurs and an alarm sounds, it is imperative that all staff, visitors and users of the building are alerted and evacuated. While it is no doubt vital that a fully functional and well maintained fire system is in place, it is also important to ensure the fire alarm is fit for all occupants of the building, and not merely the able bodied. With this in mind, reputable manufacturers have significant products and policies in place to ensure that their fire alarm systems are effective for people with disabilities, while not compromising on the effectiveness of the fire alarm system.

Specifiers should take a look at tactile devices such as vibrating pillows, which are ideal for alerting sleeping people with a hearing impairment, or vibrating pagers, which are also suitable for staff in the hotel that frequently work in isolation. Visual indications such as beacons, correctly sited, are useful for alerting hearing impaired people when they are not asleep. Then when it comes to additional facilities for visually impaired staff or guests, the means of giving warning to occupants is once again paramount. Voice alarm systems and voice sounders are an ideal solution, which can help avoid anxiety and confusion. A voice alarm system is a specially designed sound distribution system (that is, a public address system), which in the event of a fire broadcasts an alarm warning tone followed by a voice message.

When it comes to a hotel's fire detection and alarm system, another crucial element to consider is

on

reducing the number of false alarms. False alarms can be incredibly disruptive for a hotel facility – particularly if it leads to an unnecessary evacuation in the middle of the night, resulting in disgruntled guests. Another unfortunate consequence should a large number of false alarms occur, is that staff and guests alike can become complacent and fail to respond to the warning of a real fire because they believe it to be just another false alarm.

However, there are intelligent devices available such as the 3oTec fire detector, which combines optical smoke, carbon monoxide and a heat detector in one unit. This is good news for hotel facilities as false alarms are commonly caused in such environments by steam from showers or heat from hair dryers. However detectors like the 3oTec will only sound if the relationship values between each medium confirm the event as a real fire.

After all these various factors have been taken into account, the alarm system should be selected. Although this can be based on manually-operated break glass units found next to hotel exits, with at least one call point on each floor, more modern systems are likely to feature an automated system based on different detector types, such as the 3oTec.

Whatever the types of alarm system, these devices will send a signal back to the control panel. The alarm can be sounded in the form of sirens, bells or, as previously discussed, the spoken voice or a range of beacons, or tactile devices for the visually or hearing impaired.

Detection devices are also key system components and complete options include gas, flame, infra-red (beam), smoke, linear heat and video smoke as well as flame detection. Whatever types are installed, they need to enable early, reliable detection. This is incredibly important as at night when guests are asleep – if smoke and fire is not detected quickly – there is a greater risk of guests being overcome by fumes, of visibility becoming poor due to smoke, or fires breaking out in escape routes preventing evacuation. The earlier the fire is detected, the more time the hotel has to evacuate its staff and guests safely and without injury.

After the fire detection system has been installed, the system will require an agreed programme of preventative maintenance to ensure it performs as it was designed to do for the long term. Effective, regular maintenance is a must – and legal in countries such as the UK under the Fire Safety Order. The British Standard BS5839 part 1 contains the level of detail and best practice required to carry this out. A well designed, installed and maintained system coupled to good housekeeping and staff training form a large part of an effective overall fire safety strategy in sleeping risks.

Moreover, when it comes to ensuring the fire detection and alarm system remains effective, the owner / occupier has a responsibility to review and assess the risk at least annually, or after any major changes to layout, systems or use. Part of the risk assessment will include ensuring that the fire detection and alarm system remains suitable for the risk – both from the perspective of early, reliable detection and false and unwanted alarm immunity. Any changes to the hotel facility and the alarm system could require adapting the system to ensure that the highest fire safety levels are maintained.

ADT's way of helping to make this easier is its latest Generation 6 detection technology. Systems such as this offer unique functionality and additional benefits to provide speedier installation and more efficient programming once installed. These digitally-based systems also offer a superb detector lifespan between service changes: in ADT's case, ten years for Carbon Monoxide (CO) detectors and 20 years for smoke detectors – twice the current industry average, helping to reduce lifetime costs significantly

The lifetime of equipment plays an important role when it comes to cost of ownership, and anyone making a purchasing decision should take this into account. Today, an average fire alarm system should last between 25 and 30 years. In addition, cost of installation should be factored in too. Opt for the latest systems, which feature remote wireless links built into the device housing and can be installed using a hand-held management tool. This type of functionality allows service technicians to adjust the settings and parameters without having to manually access each detector.

Again referring to Generation 6 technology, the 850 and 830 series detectors included within the range use sophisticated digital signalling to communicate with the MZX fire control panel, providing a robust and secure fire detection network that is engineered to suit the requirements of the environment and application. It also comes with a range of fully approved coloured detectors and bases as standard. There are ten standard colours available – red, green, pink, blue, yellow, black, orange, gold, brown and silver – in addition to the usual white. Special batches of detectors and bases can be made to any pantone colour. Not only can coloured detectors match décor but they have operational possibilities as well. For example, red detectors might denote devices that control a secondary activity such as door release units. Green detectors might be placed on an escape route to assist evacuation to a final place of safety.

All in all, for hotel facilities, ensuring you have an effective fire detection and alarm system in place means having completed the proper groundwork in the first place. This means identifying risks and potential fire hazards, taking into account the people using the facility, and having a system designed to meet these risks. The eventual system installed should be robust, reliable and ensure that staff and guests are protected by the very latest digital technology. IFP

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For further information, go to www.adt.co.uk

On the Right Track

Beth Dean

Exova Warringtonfire

A new European standard for rolling stock fire safety testing is expected soon. It follows a 20-year project by experts from Europe's laboratories, train builders, certification bodies, regulators and component manufacturers – and is about to culminate in seismic changes to the rolling stock sector.

The publication of a new industry standard – EN 45545-2 – which is anticipated early next year heralds the introduction of harmonised fire safety requirements on rolling stock across the European Union. The enormous impact of the changes can be imagined when it is considered that almost everything on a train weighing more than 100 grams has to undergo stringent fire safety testing.

Exova Warringtonfire has been at the centre of developing the new standard from the outset, sitting on various committees and taking part in projects at both European and UK levels, so is well placed to evaluate the significance of the new regime.

Every sort of manufacturer will need to factor-in the regulatory requirements of the new standard – from upholsterers and cable suppliers, to ceiling makers and floor covering producers. The upshot is that material suppliers cannot integrate the new system into their production process soon enough.

Why the Need for Change?

At present, each national train specification has completely different test methods and safety criteria to assess materials for fire protection. The regulatory change has been driven by a desire for a safe and inter-operable system across Europe. EU countries also believe the introduction of a European rolling stock test standard is important to reduce trade barriers faced by manufacturers. The move towards harmonisation has additionally been driven by the issue of rolling stock travelling across country borders, such as the Channel Tunnel route that runs in both the UK and France.

Under the current system, each country sets its own reaction to fire requirements – so, for example, in the UK we have BS 6853, while France uses NF F 16-101. As a result, manufactures often find themselves needing numerous tests on the same product. In many cases, several tests assess the same fire behaviour parameter, for instance flame spread. European law is being changed to bring all EU countries into the same fire safety requirement regime, which embraces reaction to fire, fire resistance, and fire detection.

Developing the New Standard

The new European rolling stock fire safety requirements are expected to be set out in the EN 45545 standard series. This comprises seven parts, including: 'Requirements for Fire Behaviour of Materials and Composites' (reaction to fire); 'Fire Resistance Requirements for Fire Barriers and Partitions'; 'Fire Safety Requirements for Railway Rolling Stock Design'; 'Fire Safety Requirements for Electrical Equipment'; 'Fire Control and Management Systems'; and 'Fire Safety Requirements for Flammable Liquid and Flammable Gas Installations'.

All of these parts are currently published as technical specifications. A technical specification is not a standard, but a document with a three-year lifespan, after which it must be reviewed and either accepted as a standard; modified and accepted as a standard; or given another three years (after which it must be accepted or

withdrawn). We are now coming to the end of this phase and we expect 2013 to see the publication of all parts of the series.

The Significance of 'Reaction to Fire' Testing

The process of developing EN 45545-2 ('Reaction to Fire' assessment of materials) has involved discussion and research funded by individual organisations, industry groups and the European Commission. In some cases, completely novel test methods have been developed, which are primarily designed to better replicate real fire scenarios.

The section on 'Reaction to Fire' (Part 2) relates to the reaction to fire performance of materials and composites used on rolling stock across Europe. An earlier version of the document has been modified and the final draft of EN 45545-2 submitted as a committee document (FprEN 45545-2) for ratification. The formal voting procedure to decide if this will be published as a European Norm, 'EN 45545-2 Edition 1', is presently under way. A positive vote is expected, and publication is expected in February 2013.

EN 45545-2 Edition 1 brings together years of detailed research and meticulous development work. However, on publication as a European Norm, the revision of EN 45545-2 Edition 1 is likely to begin almost immediately. Amendments will be required because there are still some technical issues to be addressed. The aim would be to publish EN 45545-2 Edition 2 inside three years.

Current and Expected Uptake

Tests can be conducted now on the technical specification (CEN TS 45545-2) and test reports can be issued by Exova Warringtonfire. In some cases, reports against this technical specification may already be required for specific projects in Europe.

EN 45545-2 Edition 1 will generally be an excellent tool to ensure selection of fire safe products, but there will clearly be room for further development. The experts responsible for Edition 1 were not able to fully consider all comments raised by the national committees regarding the earlier draft document, CEN/TS 45545-2. Instead Edition 1 focused purely on editorial and minor technical changes. Revision work on this standard will start almost immediately after publication, focusing on areas known to require improvement. For Edition 2, the findings of the TRANSFEU project will be considered, as well as the major technical comments that could not be taken into account during the compilation of Edition 1.

On publication of EN 45545-2 Edition 1, there will be a three-year period of coexistence with the currently accepted national standards. The aim must be that, by the time this period ends, edition 2 of EN 45545-2 will be published.

During the period of co-existence, the fire safety plan for each train build will specify the fire standard that materials must be tested against, with the whole train built against the same standard. In some countries with well-established fire testing requirements for rolling stock, it is likely that testing will be required in accordance with existing national test methods during this period (for example, BS 6853 for the UK).

When EN 45545-2 Edition 2 is published, uptake should be almost immediate because this will be mandated by European law.

Added Value

Exova Warringtonfire was a partner in the FIRESTARR project, a significant project in the early development of EN 45545-2, and is currently a partner in the TRASFEU research project – a major investigation of the proposed future toxicity test method and classification criteria. The company can perform all testing in accordance with the 45545 series, with very short lead times because we have invested significant funds in equipment such as a new, purpose-designed FTIR for the toxicity test and a new seat vandalisation/seat fire test apparatus. In addition we have taken part in the Certifer round robin exercise in order to check the accuracy and precision of our test results, providing clients with additional confidence in the results.

Key Issues for Manufacturers

Manufacturers are likely to require testing against current national standards alongside the European standard for several years – probably until 2016 – with the standard selected detailed in the project specification. Even after three years, testing requirements will very much depend on the particular stage of individual projects. It should also be kept in mind that some variation between CEN TS 45545-2, EN 45545-2 Edition 1, and Edition 2 are to be expected. The significance of the variations will hinge largely on the individual product in question.

Regarding significant compliance problems, EN 45545-2 should not pose substantial issues for most manufacturers currently conforming to BS 6853 (assuming, of course, there are no major revisions, such as toxicity test changes, to the new standard before it undergoes the formal voting procedure).

In relation to economic improvements, interoperability will deliver significant economies of scale as a result of the anticipated reduction in the number of tests that need to be performed. In addition, the new system is expected to produce increased selling opportunities, in large part due to the broader, pan-European market available to manufacturers of tested products and materials. IFP

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Inspecting Passive

Good example of firestopping cables & pipes – pic courtesy of ASFP member Siderise Ltd

Niall Rowan

Association for Specialist Fire Protection

ASFP
ASSOCIATION FOR SPECIALIST FIRE PROTECTION

To assist fire risk assessors to inspect passive fire protection within buildings, the Association of Specialist Fire Protection has produced the *ASFP Guide to Inspecting Passive Fire Protection for Fire Risk Assessors*.

Fire safety legislation in the UK, indeed globally, is designed to save lives in the event of a fire. As a result, the legal requirements for passive fire protection (PFP) are aimed at ensuring that, in the event of fire, the occupants of a building can escape, fire will not spread easily within a building or to other buildings, the fire and rescue service can attend safely and the building will not collapse prematurely.

Since passive fire protection products are those 'built-in' to the fabric of a building to restrict the growth and spread of fire and smoke, they are often difficult to identify and inspect. The *ASFP Guide to Inspecting Passive Fire Protection for Fire Risk Assessors* has been produced to assist fire risk assessors and other interested parties – particularly enforcement authorities – to carry out inspections of passive fire protection as part of a fire risk assessment.

Passive fire protection products work to control the flammability of wall and ceiling linings, divide the building into fire resisting compartments, provide protection to the structure of the building to prevent its collapse, and provide protective routes for escape. Such products include: fire doors, fire resisting walls, floors and ceilings, fire resisting ducts and dampers, fire stopping and fire protection to structural members.

The aim of inspecting the passive fire protection is to ensure that the means of escape is not compromised by deficient passive fire protection measures and that the spread of fire and smoke is restricted.

Evaluating Passive Fire Protection

Any inspection should evaluate what is needed for occupants to escape in the event of a fire and then evaluate the passive fire protection accordingly. It needs to be balanced, taking into account the occupation and purpose of the building, its age and construction, as well as the building layout. It should consider the life safety fire strategy for the building and the extent to which fire resisting construction on escape routes and fire compartmentation contributes to that.

The age of the building is also important in evaluating the passive fire protection of existing escape routes. In older buildings, it is possible that the type of construction and materials used may not perform to current fire test standards. Changes of occupier and/or refurbishment may have led to the creation of cavities and voids, allowing the potential for fire and smoke to spread unseen.

In more modern buildings, it is likely that there will be fewer unsealed voids; cavity barriers should have been installed where appropriate and any breaches in fire-resisting construction, for example,

Fire Protection

for the provision of services, should have been adequately fire-stopped.

The assessor or inspector should be alert for breaches in all types of fire resisting construction and/or inappropriate fire stopping, and record these as part of the building inspection. If the building inspection indicates that there may have been significant breaches in difficult to survey locations, the assessor or inspector should recommend a more invasive inspection by a specialist third-party inspection organisation.

No firestopping of cables passing through floors – pic courtesy of ASFP member Sharpfibre Ltd

Building Layout

To be able to decide on the appropriate level of passive fire protection and evaluate it, the assessor or inspector should familiarise himself with the building layout and escape routes. If a fire strategy document exists this should provide the required information and should be considered with the building drawings.

For older buildings, or those where the information is not available, the only way to determine the escape routes and critical compartmentation may be to undertake a survey of the building layout. The assessor or inspecting officer will have to decide what level of passive fire protection/fire resisting construction is appropriate. From this, a document that lists the escape routes and where fire-resisting construction is required can be created as a basis for checking the passive fire protection.

Guidance on Each Type of PFP

Once the assessor or inspecting officer knows where and what he is going to survey, he needs guidance on the pertinent features of each type of passive fire protection to be inspected. The ASFP guide lists five main types of passive fire protection that should be assessed:

- **Lining Materials for Wall & Ceilings on Escape Routes**

The surfaces of any walls and ceilings in escape routes should be inspected to see if the materials forming the linings are satisfactory and that any additions, for example, extensive areas of notice boards, posters and carpets do not cause a hazard by aiding rapid fire spread along a corridor.

- **Fire Doors**

Fire doors are crucial in protecting the means of escape in any building. Regulatory guidance recommends doors which satisfy integrity for 20, 30, 60 or 90 minutes but this is not 'carved in stone'. All fire doors in the building should be inspected. They should be easily identified as fire doors and be marked accordingly.

- **Construction of Fire Resisting Walls, Ceilings & Floors Forming Escape Routes**

For most buildings, it should not be necessary to evaluate extensively the fire resisting construction used in escape routes or in compartmentation as these should have been covered by the building control process. However, changes in fire resisting construction of walls and floors may occur where the internal layout has been changed by relocating, replacing or demolishing internal partitions. In this case, the inspector or assessor needs to verify that the new construction is still suitable for use as an escape route in two regards: layout, as this may impact on travel distance; and type of construction, to ensure it is still fire resisting if appropriate.

- **Penetrating Services**

If a fire separating element is to be effective, every joint or imperfection of fit, or opening to allow services to pass through the element, needs to be adequately protected by sealing or fire stopping so that the fire resistance of the element is not impaired. Fire can spread through these concealed spaces and their relevant inaccessibility means they are often not checked.

- **Other Items of PFP**

The assessor should also be aware of other items of passive fire protection installed in the building and take note of their condition to ensure that there are no obvious significant defects. These include:

- Fire protection to the structure of the building.
- Cavity barriers.
- External fire spread.
- Sandwich panel construction.

While these other items may not constitute means of escape, they have a role to play in the provision of life safety and, for example, any substantial omissions or defects should be noted. IFP

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For further information, go to www.asfp.org.uk

Safety at Sea a ke

Kopstad Oddvar

Trelleborg Offshore

Safety is a key priority offshore and ensuring safety on-board, be it a vessel or production facility, is absolutely vital. Passive and active fire protection systems, which are designed to contain fire and provide protection for people when it matters most, help to create a safer environment for all. However, with the demanding and challenging offshore industry continuing to push the limits of subsea exploration and drill offshore wells even further out to sea, can these systems keep up and still provide the peace of mind that the industry needs?

The risk of rapid fire spread is greater than most in the offshore industry sometimes appreciate. As such, it is imperative that the on-board team has protective solutions in place that can provide full assurance that they will not fail to deliver on any critical firewater or utility piping installations. There are commonly two types of fire protection, active and passive, both of which are critical elements of any offshore facility and should be inherent to its design.

Passive fire protection systems are designed to contain fires and limit or slow the spread of fire throughout a facility, through the use of fire resistant materials applied to walls, doors and floors. Unlike active fire protection systems, they do not require to be "turned on", or even require power, gas or water to operate them. In the event of a fire, passive fire protection measures can contain the spread of both fire and smoke. On the other hand, active fire protection systems, such as a fire deluge system, sprinkler system of gaseous suppression system, which are again essential for on-board safety, are designed to activate either mechanically or electronically in order to extinguish fires.

However, with the demands becoming even more challenging as the maritime and offshore industries continue to push the limits, the choice of active and passive fire protection systems becomes even more important and leading manufacturers are investing significant resource and research and development efforts into devising

y priority

systems that can keep pace and provide that all important peace of mind.

Failing to Perform

For example, when it comes to passive fire protection systems, many materials have traditionally been used, ranging from glass fibres and subliming coating materials, through to phenolic foam. However, as operating temperatures continue to soar, some of these materials have proved ineffective, particularly on hot surface applications, such as separators that separate well fluids into gaseous and liquid components. In addition, in some instances poor application of these materials has led to degradation of systems more rapidly than expected, significantly reducing the effects of these protection systems.

When it comes to active fire protection systems such as the fire deluge system, carbon steel-fabricated systems have traditionally been installed to ensure on-board safety. However, these systems are prone to corrosion, which can cause vital systems to fail, and result in costly shutdowns and repairs and – in the worst case scenario – risk of failure in an emergency.

In addition, traditional systems also require constant maintenance, cleaning and testing, resulting in additional unnecessary and costly downtime.

New Technology

These failings have spurred on the development of next generation protection systems that are designed not only to stand the test of time, be low maintenance and easy to install, but most importantly provide that peace of mind that offshore and marine engineers crave.

Leading manufacturers have developed new rubber-based passive fire protection systems that can be customised to meet the demands of specific offshore and marine applications and installations. By utilising a layered construction, these solutions

provide corrosion, thermal, fire and mechanical protection and have a wide service temperature range of –50°C to +155°C. They have a design life of approximately 30 years and are normally maintenance free.

When subjecting these next generation products to heat, for example in a fire, a three step process takes place. At the first step, crystal water is generated that then evaporates to cause a strongly endothermic (heat absorbing) reaction. Next, as the materials are combustible, but are not consumed, the materials themselves create a seal that protects pipes, structures or equipment from overheating. Finally, the third step helps prevent the spread of flame and smoke, for example between modules and decks.

Applications include rigid riser or tubular fire protection, flexible riser fire protection, emergency shutdown valve protection, escape way tunnel seal and protection of riser hang-off arrangements.

Trelleborg, as an example, has developed a series of rubber-based passive fire protection systems called Firestop, which includes a collection of materials and products for protection from all kinds of fire, including a jet fire or spray fire that results from the combustion of a fuel continuously released with some significant momentum. These systems are also blast and impact resistant. This is backed up by the company's award of ISO 22899 certification (determination of the resistance to jet

fires of passive fire protection materials) for its Firestop solution, which means that the solution can safely and confidently be used for jet fire protection within pipes and hollow sections.

Corrosion-free Protection

Leading manufacturers have developed a new generation of fire-deluge systems that use synthetic rubber instead of traditional materials such as rigid steel, titanium, copper nickel and glass fibre piping.

By utilising synthetic rubber, these manufacturers have been able to create systems that are non-corroding and can withstand jet fires with a heat flux of 390kW/m^2, temperatures above 1250°C and flame speeds that exceed the speed of sound. This makes synthetic rubber ideal in deluge and sprinkler systems on offshore installations and ships, as well as numerous other high-hazard environments.

This new technology can be used to either partly or completely replace old systems and is also an ideal solution for temporary deluge systems when high safety levels need to be maintained during modification work to existing systems. The flexibility of these systems allows them to be moved and reused (if the application is temporary). Compared with rigid pipe systems, they require fewer construction drawings and the need for accurate measurements is reduced as the systems can be designed and modified on site.

Again citing Trelleborg Offshore, the company has developed a fire deluge system called Elastopipe that incorporates three core layers: the fire shield, pressure liner and inner layer. These combine to give the system high tolerance to impact, jet fire (1400°C for one hour), explosion and water hammer. The system is light weight, durable, easy to cut, fit and install. Compared with a conventional carbon steel based deluge system, which will require more frequent testing and maintenance and need replacing at regular intervals over the lifetime of the platform or vessel, such rubber deluge systems deliver a very low total-life cost. In the case of Trelleborg's solution, the flexible piping system offers a 30-year minimum maintenance life and its corrosion-free performance means system testing frequency can be reduced to statutory requirements.

Providing Peace of Mind

Safety on installations and ships is of paramount importance and having effective and reliable passive and active fire protection systems is vital to ensuring on-board safety. So it is vital that the leading manufacturers continue to develop new and proven solutions that continue to perform, even under the harshest of maritime conditions, without the need for regular, disruptive and costly maintenance and replacement. Next generation systems that utilise synthetic rubber, offer extended minimum maintenance life for systems as well as real lifetime cost savings. Due to their corrosion-free performance, system testing frequency can be reduced with confidence while maintaining full 24/7 availability, giving peace of mind to all those on board. IFP

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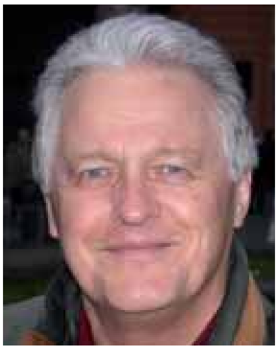
Heritage Buildings Safety and Protect



Graham Collins

When designing fire alarm and detection systems for a heritage building it is often necessary to satisfy a number of conflicting needs while also complying with fire safety legislation.

Every heritage building is unique; architectural style, construction techniques, materials, fire loading, age and state of repair vary from building to building. The one thing that can most frequently be claimed is that the vast majority of heritage buildings were originally constructed with little or no thought being given to fire safety; few are used for the purpose for which they were originally intended. We have, of course, to use the term "vast majority" because a building classified as a heritage structure does not necessarily have to be old in global terms. Many heritage buildings in, for example, the USA, Canada and Australia are young when compared with the castles and palaces of, say, China, Japan, the UK and Italy. So each one demands careful and individual consideration.

The first task may well be to determine who, precisely, is the client; or perhaps it is more accurate on many projects to pose the question, who are the clients. While on a conventional commercial development the answer to this question is invariably obvious, for a heritage-listed building it could be the current owner, possibly a national heritage protection authority, the building's occupier, whose family may have lived in the building for centuries, or an official guardian conservation group.

While they may share a broad-brush fire safety objective, frequently each has its own set of requirements and priorities. So, inevitably, a solution will have to be found that satisfies the fire safety objectives for both life safety and property protection to the satisfaction of everyone with an interest in the building; often a frustrating and seemingly impossible task. The requirement for maximum fire safety by one group may only be achieved by restricting access to another. Some heritage buildings are so fire safety challenging that enforcement authorities may even decide that the only way to ensure maximum fire safety and a safe means of escape is to restrict public entry to parts of the building or limit the number in the building at any one time.

A starting point therefore is to obtain a detailed understanding of the risks as perceived by each client, to ensure that the designer's solution meets everyone's expectation and reflects what they perceive as the key requirements. This can be an extremely time-consuming, lengthy and challenging process.

Document the Detail

Accurate and reliable drawings are often difficult to obtain, even in relatively modern buildings; drawings for heritage buildings are frequently grossly inaccurate, lacking in any real detail, or simply missing altogether. In reality, particularly with ancient structures, they may never have existed in the first place.

– Designing for
ion

So, it is imperative that all available information is mustered, confirmed as being currently correct and then fully understood to gain an accurate picture of the building, including its structure, voids and cavities. Only in this way is there any prospect of a solution being developed that addresses the risks while remaining sympathetic to the age and style of the building.

Even then it is essential that the fire detection and alarm system designer becomes intimately familiar with the structure by walking through the entire building to identify any possible fire safety challenges. These can include high or ornate ceilings, intricate architectural details, wall hangings, dead-end corridors and a lack of compartmentation, as well as features that do not appear on any architectural drawings but nevertheless are barriers to the line of sight for detection systems. This walk-through also gives the fire engineer the opportunity to prepare or update a fire risk assessment.

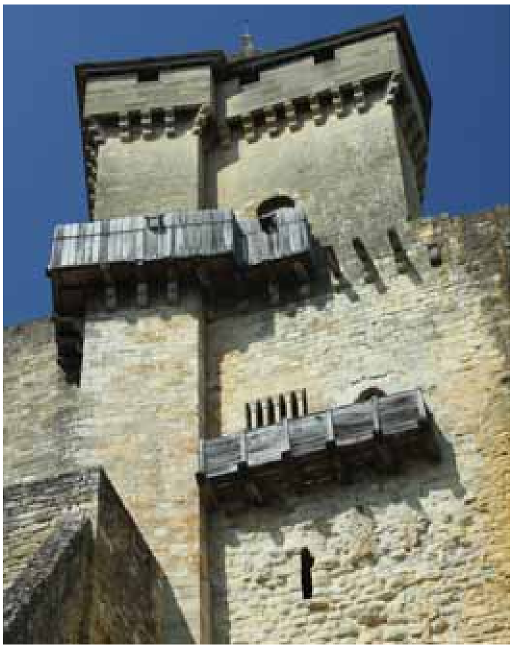
This information should then be clearly documented, recording concept, design, installation, commission, handover, in-service maintenance, life expectancy and, ultimately, de-commission. This record, along with an accurate and up to date fire risk assessment, can be utilised to support any design recommendations.

Design Considerations Approval Timescales

These pre-design exercises will invariably unearth fire safety problems that can only be overcome using fire engineering principles and, often, some creative thinking. Frequently, this will involve looking at innovative solutions, so an appreciation of the emerging fire safety technologies may well help in the delivery of sympathetic, yet effective solutions.

Aesthetic considerations invariably raise their head and are inevitably major considerations. Issues such as the visual acceptability of detectors, sounders, agent discharge heads and surface-mounted cables, along with the prospect of damaging or detracting from the fabric of the building will undoubtedly be the subject of often heated and lengthy debate. Understandably, any provision that can be introduced that limits any potential damage or visual intrusion is sure to be welcomed, although manual call points, by their intent, have to be clearly visible. This need to inhibit the visual impact of fire detection devices has undoubtedly boosted the use of aspirating detection and beam-type smoke detection in heritage buildings.

Vast numbers of people visit heritage buildings – the numbers for the most popular can run into hundreds of thousands and, in some instances, millions – some of whom will have mobility problems and possibly poor eyesight, so it is important that escape routes, doors, signs, and potential



hazards, such as stairways and corridors, are clearly visible. As all escape routes require illumination, this could be very extensive and it should be remembered that required emergency light levels have increased dramatically in recent years, although most emergency lighting systems in heritage building remain lamentably poor.

An option for the fire engineer endeavouring to ensure that the emergency lighting is in harmony with the heritage environment is for it to be integrated into the normal lighting at a design stage. Emergency signage and exit route indication is another challenge that needs to be achieved within the fine balance between effectiveness and aesthetic considerations.

Approval Timescales

The approval process is dependant on a number of factors, such as the building itself, its size, age, conservation listing, architectural merit and rarity value, although in some cases fire safety system design decisions may ultimately be in the hands of the client. However, the majority of heritage buildings have sufficient historic, artistic, cultural or architectural importance to ensure that fire safety installations are monitored. Many heritage building solutions include the use of fire engineering techniques rather than prescriptive measures and there is clearly scope for disagreement that can result in protracted negotiations. These need be factored into the project timescale.

A documented strategy should include as much information as is possible to support the choice of fire detection equipment, including details of the fire risk assessment and other risk assessments, along with comprehensive design drawings. The

inclusion of any relevant expert opinions in support of the proposed solution should also be incorporated. Of course, the content may well be questioned and the designer called upon to explain the various design decisions, so the length of time that an approval may take should not be underestimated. The timescale varies from project to project and from one approvals body to another. Agreement may not be reached until all the modifications have been adopted, and often re-submitted.

The introduction of newer technology or new fire engineering solutions may well be challenged if they are unfamiliar to the client and the regulatory authorities and approvals bodies. However, when approvals have been accepted, the designer may be required to provide a design certificate to enable the next phase of works to proceed.

Sympathetic Installation

The installer must be aware of the designer's sympathetic approach to the heritage issues and the specific instructions of the designer, the client and the system's manufacturer. Also, during installation and commissioning the designer may be called upon to advise on any modifications required to overcome unforeseen difficulties that were not identified during the detailed design phase.

Naturally, any alterations need to be agreed with the client, the regulatory authorities and approvals bodies and should be incorporated into the final design drawings and be transferred to the operation and maintenance manuals, along with all of the relevant documentation. This includes all of the initial assessments, approvals and certificates, as this will provide an immediate audit path for any future developments. The manuals should also include any product support information, and the client should be made aware of the importance of the safekeeping of the documentation.

Commissioning and Beyond

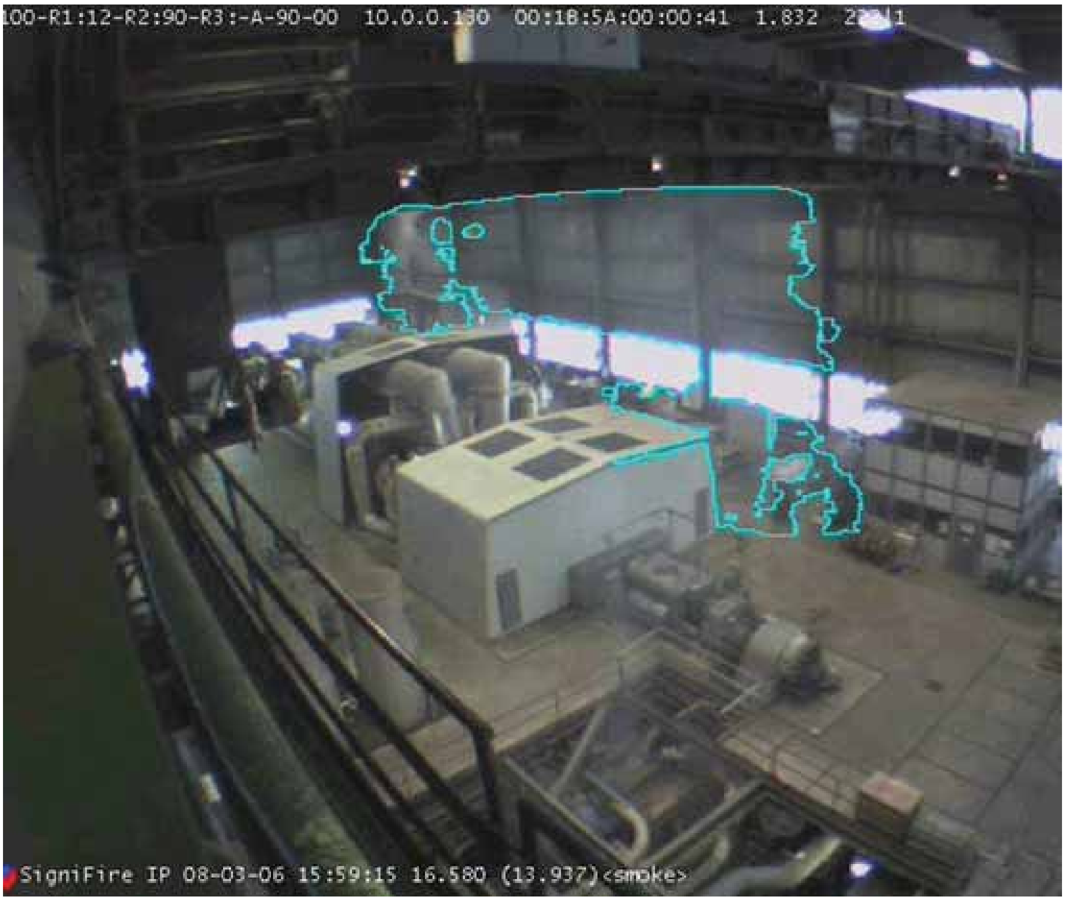
At the commissioning and handover stages, the designer should verify that the installation is operating in accordance with the design. The commissioning engineer should supply a commissioning certificate upon successful completion and, if the designer or any third parties are providing verification, a verification certificate should also be supplied. It is wise to agree a time for a "soak test", to allow the systems to settle and the client to become familiar with the technology. Particular care should be taken to ensure that the installed equipment is fully understood by the client and the end user as this will help to build confidence in the technology. It is equally important for the end user and appropriate staff to be adequately trained.

As with the need for the installer to be sympathetic to the design, so there is a need to ensure that the maintainer of the installation shares this understanding. Equally vital though is to be sure that the maintainer understands any new technology, particularly at the early stages, as the client's confidence will be very quickly eroded if confusion or misunderstandings arise.

Indeed, lifetime in-service maintenance and supervision of the installation is key to ensuring the long-term effectiveness of the system and to justify the investment. Under-investment in this area risks undermining the design decisions. A very effective control mechanism to ensure that the system remains effective is the ongoing fire risk assessment and the record of false alarms or systems failures. These, along with changes in the structure or material change of use of the building must be analysed against the original scope and objective of the fire system design.

Continual maintenance is more effective than simply waiting for the annual or bi-annual service review. Therefore, it is essential that a qualified maintainer completes and updates a detailed log-book, providing the paperwork to enable an audit trail should the designer be asked to revisit and update the system in the future.

Teamwork is the key to success with heritage projects, with the fire engineer, client, regulatory authorities and approvals bodies, the system provider, installer and maintainer working together to a shared agenda. In this way the solution can be supported long after commissioning to ensure the long-term protection and survival of the particular country's unique heritage, of which can all be justly proud. IFP



Video Image Detection:

Innovative Technology for Fire Protection

Alan Locke

Fike Safety Technology

All of us recognise fire when we see it – we know what a fire looks like so this is, for us, a reliable method of fire detection. The same idea is the basis for video image detection, a fire detection technology currently creating a lot of interest. But how does an automated system reliably detect fires simply by looking for them?

While conventional fire detection systems rely for their operation on a variety of heat, flame and smoke sensors, the sensor used in video image detection (VID) systems is a CCTV camera of a type similar to (though not necessarily identical to), those used in security installations. And the way that VID systems operate is, in principle, very simple. One or more CCTV cameras capture images of the protected areas, and these images are then analysed using sophisticated algorithms that look for the tell-tale signatures of a fire.

The exact details of the algorithms used are proprietary, but the principle can be readily explained. Like all video images, those captured by the cameras used in VID systems are made up of a large number of picture elements or pixels, arranged as a rectangular array similar to the grid of a crossword puzzle. In a typical VID system, the grid has 640 pixels horizontally and 480 vertically.

The algorithm analyses this 640×480 pixel frame (over 300,000 pixels) 15 times a second. The data used by the algorithm is the luma value of the pixel, or how bright that pixel is. It uses a digital signal process to track each pixel location over time, so in one second the algorithm has read the luma value of over 4.5 million pixels. If the

pixel location stays bright for those 15 frames it is given a high static brightness value; if the pixel location flickers bright/dark at the frequency of fire flicker it is given a high dynamic brightness value. This normalised data is constructed into a pattern every second and then fed to a neural network that has been trained on thousands of patterns of actual fires and nuisance events. If the pattern of a bright core at the bottom with a flickering corona near the top matches the trained neural network for four continuous seconds, then a flame alarm is generated. The same type of methodology is used for smoke but with obviously different pattern matching algorithms.

While this approach to fire detection may seem unfamiliar, it offers a number of very important benefits. Let us start by looking at fire protection, considering first a conventional installation, which is likely to include smoke detectors as a primary component. While these are reliable and useful devices, they have an important limitation – they cannot react until the smoke reaches them.

In a high-bay warehouse or even in the tall atrium of a modern building, it can easily take several minutes for the smoke from a fire at low level to reach a smoke detector high in the building, by which time the fire has already become established and likely spread to other parts of the facility. In fact, in some applications conventional smoke detectors will never respond. For example, in cold storage applications, the smoke is chilled as it is produced and never rises to high enough levels to register with typical smoke detectors.

VID camera does not even need a direct view of the flames to detect a fire. It will also respond to reflected light from flames, effectively allowing it to “look around corners” and beyond obstructions.

VID systems provide very economical protection for large volume enclosures. Protecting a large distribution warehouse or sports facility with a conventional system may require dozens of smoke and/or heat detectors, but with a VID system two or three cameras are almost always enough to do the job. VID systems can also be used outdoors, where providing protection with a conventional system is almost impossible. For example, monitoring waste bins near schools and industrial units, which are frequent targets for arsonist attacks.

VID fire detection offers special benefits in roof voids, especially where access is limited such as with historic buildings. If an ordinary detector is triggered in such a void, it is difficult to confirm what is going on. Is it a false alarm or is there a real and possibly very serious problem? With a VID system, these questions can be answered instantly, simply by looking at the images from the VID camera.

Since even the largest VID systems require only a relatively small number of cameras, they are much easier to install and to maintain than conventional systems. And of course, in these cases, installation costs are much lower. A VID system can also operate as a security CCTV installation, while simultaneously performing its primary function of fire protection. A VID system can provide video recording, as well as remote and local monitoring

Video image detection is very effective not only at detecting real fires, but also at discriminating against false alarms. These types of systems provide cost-effective protection for large volume enclosures.

of live and recorded images, just like a standard CCTV installation. The need for a separate CCTV system for security purposes may be eliminated, representing a substantial cost savings in installed equipment, but also throughout its life as there is only one system to service and maintain instead of two.

Of course smoke detectors are not the only type of conventional detector. Heat detectors are also popular, but have a similar limitation; they cannot react until the heat from the fire reaches them, which typically takes minutes rather than seconds. There are also specialised detectors such as air aspirating types, but these are more complicated and costly to use, especially if large volumes are to be protected.

With a VID system there is no need for the smoke from a fire to reach the camera in order for it to be detected – as long as the camera can see the fire it can react immediately. It might be argued that projected beam smoke detectors offer similar benefits, but in reality they provide limited area coverage and are often difficult to install because of obstructions like light fittings and building structural members.

It is also important to remember that the VID system looks for flames and smoke, so it can react to fast flaming fires almost instantly, before any significant amount of smoke has been generated. Speed of reaction is an important benefit of VID systems. In research carried out on behalf of Fike, the typical response time of the VID system to a flaming fire was around three seconds. In contrast, smoke detectors took 25 seconds, and heat detectors did not respond until between three and four minutes after ignition of the test fire. In fact, the

How well do VID systems really work in practice?

To help provide a definitive answer to this question, Fike commissioned independent research carried out by a respected organisation with long experience in the fire protection sector. The research involved 63 tests where the effectiveness and speed of response using VID technology was compared with an air-sampling detector, a projected-beam smoke detector, spot-type ionization and photoelectric smoke detectors and a linear heat detector. The VID detector used for these tests was a standard unit from the Fike Signi*Fire* product offering.

In every test, the VID unit detected the fire and, in 61 of the 63 tests it was the first detector to respond. The only other detector to respond to all of the fires was the air-sampling unit, and this responded significantly more slowly in all but one of the tests. It is clear from these results that VID technology is both versatile and reliable.

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As we have seen, VID technology has many attractions and benefits, but not all VID systems are the same. In fact, there are two main types. The first uses standard CCTV cameras and can, in some instances, even use existing CCTV cameras that are already in place for security or other purposes. The cameras work in conjunction with a digital video recorder and VID software that analyses the images from them to identify fire signatures.

This type of system can work well and is potentially a very economical solution where suitable cameras are already installed. It is, however, essential to understand its limitations. The most important of these is that, if the DVR or the software that is being used for the VID image analysis crashes, the whole fire protection system becomes ineffective. Another issue is that existing cameras are unlikely to be wired with fire-resistant cables, which means that the system may not meet regulatory requirements. And if new cameras are being installed, the need to use fire-resistant video or network cabling will significantly increase costs.

The second type of VID system uses dedicated cameras that have built-in image analysis capabilities of the type described earlier. These cameras are usually linked via an IP network to a network video recorder (NVR) at a monitoring station where their images can be used for security purposes. Crucially, however, they have a separate contact-type output that operates if they detect a fire, and this can be linked directly to a fire control panel.

The key benefit of this arrangement is that if the network or the NVR fails, each of the cameras continues to function as a fire detector and each can still send an alarm signal directly to the fire control panel. Another benefit is that, as the network cabling does not play an essential role in the fire detection function, fire-resistant cable does not have to be used. Standard inexpensive and readily available CAT 5 network cable is perfectly adequate. The only wiring that may need to be fire-resistant is the twin cable connecting the camera's alarm output to the fire control panel.

A further benefit of this arrangement, with its use of network technology, is that it is easy to arrange for the images produced by the system to be monitored remotely, off-site or even in another country, by using Internet links. For big companies, this opens up cost-saving options for central monitoring of multiple sites.

It is worth mentioning that VID technology, in addition to being an excellent choice for providing fire protection in buildings, can have other slightly less conventional applications. An example relates to a machine used to manufacture abrasive pads. One stage of the production process involves baking these pads at a high temperature using an infrared heat source and, from time to time, the adhesive used in the pads catches fire. This is not a particularly dangerous condition, as the machine is built to contain and withstand these small fires, but it is necessary to stop the machine and draw the operator's attention to the problem as soon as possible. VID technology, using a dedicated camera with an alarm output, is an ideal solution. The camera does not have to be accommodated within the machine itself, which is quite difficult – the camera just needs to be mounted where it can see the area where the fires occur. In the event of a fire, it provides an almost instant response to the flames.

The introduction of VID technology is arguably the biggest step forward in fire detection for decades, yet it is only natural for specifiers and end users to have some reservations about a system that is so innovative. Hopefully this article demonstrates the benefits VID can offer and that in many applications, these advantages are unmatched by any other currently available method of fire detection. IFP

There are two main types of video image detection. The first uses standard CCTV cameras and can, in some instances, even use existing CCTV cameras. The second type uses dedicated cameras that have built-in image analysis capabilities.

Alan Locke is Head of UK and Export Sales for Fike Safety Technology

For further information, go to www.fike.com/corporate/sub ukfst.asp#

Understanding Watermist

British Automatic Fire Sprinkler Association

The British Automatic Fire Sprinkler Association (BAFSA) has published a Technical Guidance Note for the UK Watermist Co-ordination Group to provide easy access to a range of third-party information to illustrate the benefits of incorporating watermist fire suppression into a particular building design.

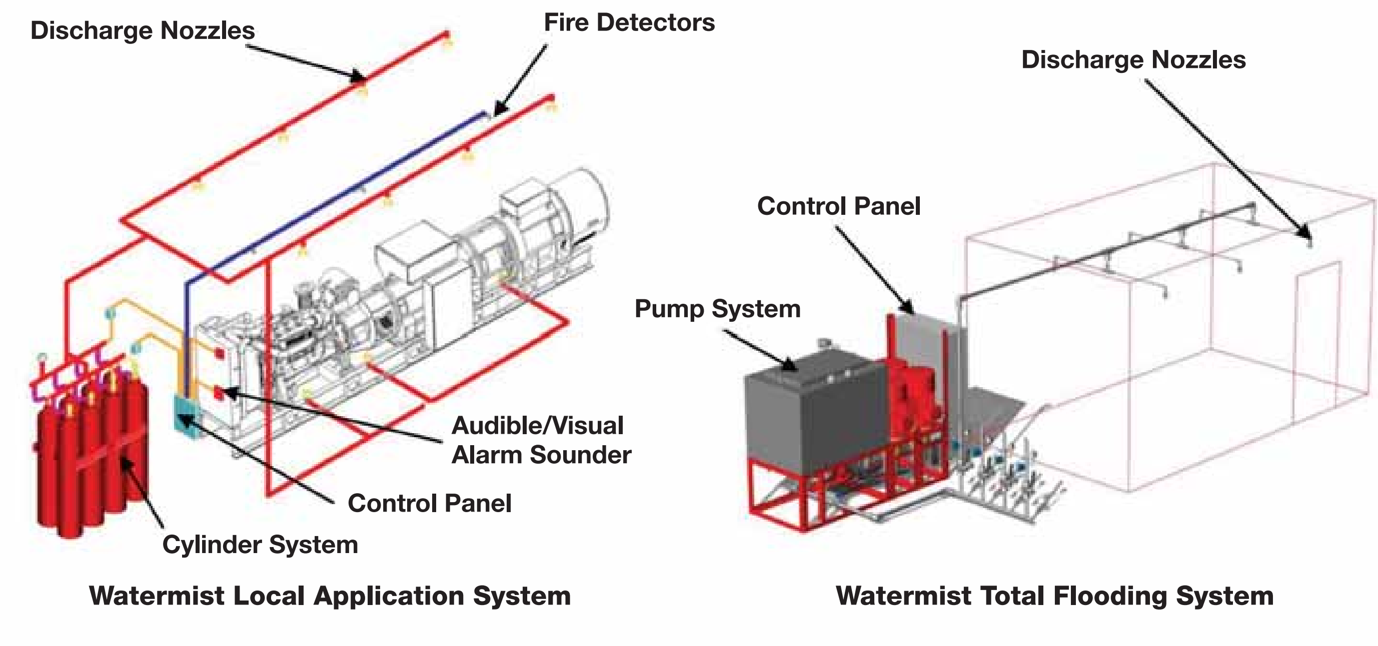
This Technical Guidance Note will allow all those involved in the building process, such as property developers, authorities having jurisdiction, architects, designers and end users to determine the most advantageous approach to compliance with building regulations.

The key to the success of watermist is the ability of small water droplets to suppress or control a fire extremely efficiently. Grinnell first successfully employed its 'intelligent use of water' in the form of very small water droplets in its 'pepper pot' nozzle in the 1890s. Such systems proved to be a fast and efficient method of extinguishing fires by rapid cooling and oxygen displacement.

The land-based breakthrough for watermist technology came in the beginning of the 1990s when the rapidly expanding food industry recognised the immense benefits of watermist in swiftly suppressing or extinguishing the potentially disastrous fires that could result from the range of oil-based cooking processes carried on in such premises.

Another watermist application developed following the fire on the passenger ferry Scandinavian Star in April 1990, which killed 158 people. This tragedy galvanised the watermist industry and in 1993 it conducted a large series of cabin and corridor fire tests that led to improved International Maritime Organisation fire safety requirements on passenger ships and the development of installation guidelines and fire test procedures for alternative sprinkler systems.

Advances in watermist technology have led to the production of British, European and International standards and guidelines for the design, installation, commissioning and maintenance of watermist systems to combat Class A, B, C and F



fires in a wide variety of domestic, residential, commercial and industrial applications.

How Watermist Works

A traditional sprinkler system removes the heat element of the fire triangle (oxygen, heat and combustible material). Watermist removes both the heat and oxygen elements of the triangle. It achieves this by dispersing water through specially designed nozzles at low, medium or high pressure. Generally, as system pressure increases, the water droplet size decreases. This, in turn, significantly increases the total surface area of the unit and so leads to the production of a greater volume of steam, removing more energy from the fire, which generates the steam.

The smaller a water droplet size is, the larger the surface area becomes and the more effective the system becomes in rapidly reducing the temperature and oxygen at the flame front of a fire. This is because the heat absorption capacity of watermist is greater than any other water-based suppression system. To put it another way, when water is converted into steam – which is what happens to the water droplets in watermist – then quite a lot of energy is used, energy that is taken from the fire that has occasioned the watermist discharge. This reduces the strength of the fire.

NFPA Standard 750 uses a definition of water droplet sizing to distinguish between watermist systems and other water-based systems such as sprinklers. Watermist is defined in NFPA 750 as a water spray for which 99 percent of the total volume of water discharged is in droplets with a diameter less than 1000 microns at the minimum design operating pressure of the watermist nozzle.

Fire engineers, consultants and specifiers will wish to approach the fire protection design task by carrying out a detailed fire risk assessment of the premises to be protected, and will establish the fire risk classifications detected therein. Hence, they can determine which type of watermist system and types of nozzles can best be used to deal with the perceived threat of fire.

The Guidance Note clearly defines the types of watermist systems – wet, dry, deluge, pre-action – and summarises system classification; nozzle technology, types and applications; pipes and fittings; principles of operation and appropriate environments.

System Classification

System classification is based on the atomisation ability of the watermist nozzle, its orifice, filters and strainers when water at operating pressure is discharged through the nozzle.

Pressures are rated:

Low Pressure (less than 12.5bar)
Designed to retain all the proven performance and reliability of traditional water-based systems, while capturing the efficiency of small water droplet, watermist technology. Ideally suited for the protection of rooms, corridors and spaces where light-to-moderate fire loads of ordinary combustibles exist. Low-pressure, open nozzle systems are also ideal for the protection of hazards involving flammable liquids. The addition of aqueous film-forming foam (AFFF) maximises extinguishing performance.

Medium Pressure (between 12.5 and 35bar)
Primarily used for local applications as good, low-cost alternatives to the more efficient high-pressure systems. With a minimum operating pressure of 35bar they were mainly used for such as the protection of diesel engine generator sets, boiler fronts and oil separators.

High Pressure (ranges from 35 to120bar)
The average total surface area of the droplets in the mist from a typical high pressure water mist system is at least 100 times greater than conventional sprinkler droplets for the same volume of water. Therefore, significantly less water is required to absorb an equivalent amount of energy from a fire.

Oxygen depletion is significantly increased by high pressure watermist at the flame front in both specific object protection and total flooding applications within completely enclosed spaces, particularly where the fire is large in relation to the space. A further highly beneficial effect of high pressure water mist is the dramatic reduction of

harmful products of combustion caused by the washing out of smoke particles from the fire.

Pipes & Fittings
The material used for the pipework and fittings for watermist systems is governed by the nature of the estimated fire/fuel load and the water pressure required to protect the perceived risk. High-pressure systems normally require the use of stainless steel pipework and fittings. Low-pressure system pipes and fittings can be of zinc-plated carbon steel or copper or cpvc depending on the type of application and risk involved.

Compliance
Following increased awareness and interest in the application of watermist as an alternative firefighting medium, the organisations responsible for national and international standards and approvals documents have worked hard to introduce and publish robust and updated watermist standards and approvals. Commercial, industrial, residential and domestic watermist systems can be specified and installed to a number of standards including those issued by BSI, CEN, FM, UL and NFPA.

Before the relevant Standards can even be applied to the design of a system, a period of consultation followed by approval with specific parties is necessary. It is also essential that the specifier seeks a written technical specification from the preferred lists of watermist contractors on how the system will be designed, installed, commissioned, tested and maintained in accordance with the recommended watermist standards. This procedure is vital because watermist is a relatively new technology for certain more recent applications and systems can vary considerably in the way different manufacturersí products and systems work.

A written technical specification will be required as evidence of the competency of the proposed watermist contractor and its willingness and ability to follow the watermist standards to the letter. If any aspect of the watermist standard is omitted, then the specifier is advised to remove the offending contractor from the preferred list of suppliers.

By choosing watermist companies where products and services comply with British, European and international standards, specifiers are able to mitigate risk at every stage of a project, from design, manufacture and installation, to commissioning and maintenance.

At the time of publishing, there is only one certification body listing watermist installers – Warrington Certification Limited. Its 'FIRAS' Certification scheme for installers has been instrumental in improving standards of passive and active fire protection product and system installation.

The UK Watermist Co-Ordination Group recommends that system specifiers seek physical evidence of the contractorís ability to install, commission and maintain the watermist system to the requirements outlined in the Note.

Applications and Limitations
A detailed risk analysis is an indispensable precondition for determining the best form of fire protection or firefighting medium required to control, suppress or extinguish a specific risk. For example, is the system primarily required for property and asset protection or for enhanced reliability (life safety) applications?

While most watermist applications currently relate to property and asset protection, it is accepted that watermist can improve tenability in certain circumstances within protected spaces by rapidly cooling the room/space temperature sufficiently enough to allow safe passage away from the seat of the fire. Nozzle positioning is a key factor in the success of watermist system design and compliance with nozzle heights and spacing that has been validated by the nozzle manufacturerís tests is also a crucial requirement.

In some instances the very fine water droplets of watermist behave more like a gas than a liquid, and can be affected by air movement and/or the size, character and internal layout of a building, therefore acceptable ventilation air flows must always be taken into consideration. Although the use of watermist for area protection (total flooding systems) is less susceptible to room leakage than gaseous fire suppression systems, it is the responsibility of the installer to specify the acceptable equivalent leakage volume for any protected area on the basis of tests.

Strict compliance with the fire tests outlined in the UK's DD 8458-1:2010 and DD 8489-1:2011 will reassure the watermist system specifier that any doubt about the integrity and functional efficiency of a proposed watermist system can be discounted. However, it should also be remembered that situations could arise where a watermist system may be the most suitable option to protect a special type of risk that is not covered by DD 8458-1:2010 and DD 84890-1:2011. In this instance it is strongly advised that the watermist contractor responsible for the design and installation of this type of system arranges a bespoke test (authenticated by a third-party certification body) to provide the specifier with clear physical evidence that the proposed watermist system will perform in the required manner.

Standards of excellence in the design, installation, commissioning and testing of watermist have significantly progressed and are now in keeping with other traditional forms of firefighting media. IFP

System classification is based on the atomisation ability of the nozzle, its orifice, filters and strainers when water at operating pressure is discharged through the nozzle. Pressures are rated: low pressure (less than 12.5bar); medium pressure (between 12.5 and 35bar); and high pressure (ranges from 35 to120bar).

This Guidance Note is available for purchase price £15 inclusive of UK postage. Email your order to mailto:info@bafsa.org.uk

For further information, go to www.bafsa.org.uk

Saturday, August 25, 2012 – Fire rises over the Amuay refinery near Punto Fijo, Venezuela. The huge explosion rocked Venezuela's largest oil refinery, killing 48 people and injuring dozens.

AP Photo/Ariana Cubillos

Passive Protection

When thinking of fire safety most people think about the smoke alarms that detect a fire, the sprinkler systems that are activated once a fire is established and the risk to the building's occupants has increased considerably. However if a building's passive fire protection is well planned and installed there is every likelihood that these alarms may never be activated.

Kjetil Bogstad

Protecta

As buildings and their internal systems for IT, building and energy management become more complex and often more integrated there appears to be an upsurge of interest and an evolution of products in the market for passive fire protection, and there is no doubt that change is on the horizon with new approaches and solutions being introduced.

We are about to witness some significant changes in the passive fire protection market. These changes are being driven by ever more stringent legislation, economic drivers, both the increasing costs of raw materials, the ever tighter margins on both new construction and refurbishment projects and, finally, the demanding designs of 21st century architects who are encouraging us to think and use buildings in new and creative ways.

Combining the highest levels of safety and compatibility, within economic restraints, without compromising on the aesthetics of the building is just one of the challenges facing every aspect of the construction market, not least of which are passive fire protection solutions that include fire stopping installations, seals and dampers.

The Challenge of Certification

Many products currently available for passive fire protection are either not certified or are only certified for very specific applications, making it a minefield for specifiers and installers to be sure that the product they specify and subsequently install is the right one for that particular application. One example of this is fire protection sealant, which is often tested for linear use but not for use around a penetration. Despite this in many instances the product will be used for the latter application with little or no regard given to whether it is actually 'fit for purpose'.

A product installed in a linear fashion is going

Gets Active

to be subject to different installation processes and ambient conditions to one that is being used to seal a penetration. Simple variations and discrepancies may also arise for a product that may be certified for a particular aperture size with a certain surround, one small variation in either aperture or surrounding material may have a significant impact on the efficacy of the installation.

Even if a product is fully certified there is evidence that in some cases the installation process is far more complicated and difficult than may be necessary and, obviously, if the installation is not carried out the highest levels the final integrity of the overall installation will undoubtedly be compromised. One of the problems that has constrained development in the European market has been the constant upgrading of the European test standards.

While no-one disputes the necessity to ensure that buildings are made as safe as possible the current programme of certification is not only extremely costly but also very time consuming. Consequently many companies either give up or have large gaps in their product ranges as a result of lapsed certifications, either on the basis of performance and/or the production of their products. As a consequence the range of certified solutions available to the market becomes increasingly more limited.

We are about to witness some significant changes in the passive fire protection market. These changes are being driven by ever more stringent legislation, economic drivers, the increasing costs of raw materials, the ever tighter margins on both new construction and refurbishment projects and the demanding designs of 21st century architects who are encouraging us to think and use buildings in new and creative ways.

As alluded to earlier, much of the new development in passive fire protection solutions is being driven by the architects who are seeking secure products that are fully tested in the way the product will finally be installed. On the other hand the installers are demanding products that are easy and quick to install, backed up by full technical support from the manufacturers. A broader view of this is the ever increasing commercial pressures on construction companies that are operating to tighter and tighter budgets on programmes that allow little or no room for delays or complex sub-contractor installation programmes.

There is no doubt in the current climate that the old adage, 'time is money' is definitely in the minds of many construction project managers. Coupled with this an increasing number of countries that are focussing on the environmental issues; be this emissions during the production of a building's component parts, through to energy efficiency, waste management and pollution of the

final building. Environmental efficiency is no longer just an afterthought for the construction industry; it is driven by legislation at the highest level and any company wanting to supply products and succeed in this market has to make this a cornerstone of their production techniques, without compromising on performance.

However there does seem to be some regional variation with regard to strict adherence to the rules. In countries such as Scandinavia, Germany and Austria there is a high level of awareness of regulation and product properties, while in Southern Europe and the United Kingdom the key driver still appears to be price. In contrast, the less sophisticated construction market found in Eastern Europe, while aware of the legislation, appears to lack the practical experience and knowledge and has some way to go before fully understanding and embracing the passive fire protection market.

There is no doubt that fire sealers, dampers and other passive fire protection solutions have and continue to make a significant impact on the safety of buildings and the protection of lives, even though they represent a relatively small percentage of any project's overall budget.

One recent example of how the market is changing is the new test standard EN 1366-3:2009, which has completely changed the rules on how to evaluate tests. The previous test standard was based on using maximum apertures with services; it is now minimum aperture with services and a blank seal to prove maximum allowed size. This and many other changes especially on the types of services to test, means in practice that all product tests carried out up to 2009 had to be redone. Protecta is currently running approximately two major tests every month at Exova Warringtonfire just to get the same or better certifications than it used to have prior to this new test standard.

As an organisation we have now completed over 600 tests for just the main core of ten fire-stopping products. It costs millions of pounds and takes years and many companies are either not be prepared to make that investment or may not have the financial resources to do so.

Customer's Needs are Essential

However it is not all about the manufacturer, the customer's needs are essential. As a developer, manufacturer and supplier of fire-stopping products, companies can have some influence on the types of services that are allowed to penetrate the walls of fire cells. Manufacturers have a responsibility to make sure that the products' field of application gives the specifiers and installers less

challenge when deciding on the right solutions. The ever increasing combined demands of environment and health and safety make it even more important that the fire stopping product does not limit the possibility to meet demands other than just fire resistance. In the past it has been necessary to test new types of services like:

- Aluminium pipes.
- Rubber foam insulation.
- Pipe insulation running through the aperture.
- Insulation ending 0.5 metres to one metre on each side of the wall.

As stated earlier the new test standard demands a blank seal to be tested to decide maximum aperture size. Depending on the product and its normal field of application Protecta has tested large apertures up to 1200mm by 2400mm (height and width) and 100mm wide linear seals with a fire rating up to EI 240 for concrete walls and floors. Similar large apertures in a plasterboard wall have also been tested with a fire rating up to EI 150 without the restraint of a gypsum frame in the aperture.

Protecta's own laboratory in Tønsberg is mostly used in the development of new products and exploring new fields of application for old products. In addition it has also been used in the development and completion of live building projects where Protecta cooperates with the architect, fire safety engineer and/or other stakeholders to find a solution where no other solution is currently available or viable to the building industry.

In the UK one of the leading tests centre is Exova Warrington Fire. This highly respected test centre is currently handling an extensive test program on behalf of Protecta that will enable it to extend both the range of products and the field of application in which there products can be used.

Despite the problem of regular certification and legislative changes, the passive fire protection market is one in which continuing research and development is generating some innovative solutions to traditional programmes. For some time the only solutions on the market for gypsum walls were based upon a gypsum frame. Often viewed as the most secure means of fire protection these products were not popular when they came to be installed on site. By taking a different approach to the problem and going right back to production techniques, Protecta was able to design a solution that had increased flexibility, even under extreme temperatures without the constraints of a gypsum frame and without any loss of sealing capability or protection.

What Does the Future Hold?

Companies need to adopt a new approach to passive fire protection. It needs to be more practical and developers and engineers not only need to understand about fire, but they also need to appreciate how these new products are going to be integrated into the latest construction techniques to ensure that modern buildings offer the highest possible level of fire protection and containment.

One of the knock-on effects of this need for a new approach and a higher level of investment in research, development and testing is that there will be fewer companies across the globe manufacturing, testing and certifying products. A few, with the both the financial security and technical skills to survive and flourish will probably end up supplying the bulk of the global market with branded products. They will then face the joint challenge of maintaining the technical expertise alongside ever more demanding levels of customer service and support.

There is no doubt that fire sealers, dampers and other solutions from the passive fire protection market have and continue to make a significant impact on the safety of buildings and ultimately in the protection of lives. While a relatively small percentage of any project's overall fit-out budget, with continued investment in product development married with the education of architects, specifiers and contractors about the benefit of new and alternative approaches, passive fire protection will play an increasing valuable but still unseen role in the protection of both lives and property. IFP

Kjetil Bogstad is CEO of Protecta

For further information, go to www.protectapfp.com

Performance-Based

Haukur Ingason & Jonatan Gehandler

SP Technical Research Institute of Sweden

Most guidelines and standards for road tunnels are what are called prescriptive; they tell the engineer in detail how to build a safe tunnel. However, building codes are moving more and more towards what are called performance-based codes, where engineers have more flexibility to come up with new solutions. In new complicated construction projects this may save money and make the constructions safer, so a proposal for performance-based design of tunnels has been developed by a research team in Sweden.

SP Technical Research Institute of Sweden and Lund University have recently finished writing a proposal for a more performance-based orientated road tunnel guideline for the Swedish Traffic Administration (STA). The background is that STA has, since 1995, written its own technical specifications and guidelines for road tunnels in Sweden. These technical specifications or guidelines have been mainly prescriptive. About two years ago SP was awarded a project to come up with a proposal for more performance based guidelines, the main objective being to specify a safe tunnel. The definition of what a safe tunnel means has been a challenge to define. It was soon realised that the cost for a completely safe tunnel under all circumstances is not achievable, so the next question is how much taxpayers and society are willing to spend on tunnel safety.

In order to come up with a balanced solution, a concept based on four cornerstones was developed. The first is that risks that can be handled with reasonable means should be eliminated; the second is that catastrophic situations should be avoided; the third is that the resources of the society should be used where they are most useful and, finally, risks should be in proportion to the use.

One of the basic conditions for a useful framework of a guideline is that Swedish laws must be employed. This would give the minimum level of safety. The framework can be developed in different ways. For example it can be described in a prescriptive way, or in more performance-based way. The disadvantage with prescriptive solutions is usually that the costs may become unreasonably expensive for certain types of tunnels, or alternatively more effective technical solutions will not be allowed as they do not obey the prescriptive solutions. Performance-based requirements on the other hand allow alternative solutions, as rather than specifying the solution, a functional requirement is defined. A disadvantage with performance-based solutions is the need to prove that the functional requirement truly is fulfilled. It is for this purpose essential that functional requirements are clear and verifiable.

The research group proposed in its work a hybrid acceptable solution – prescriptive requirements and performance-based requirements. The new building rules in Sweden are a good example, which the group decided to follow. Taking a top-down approach a guideline was developed based on existing laws in a structure as can be seen in Figure 1.

The guideline has a hierarchal structure in which, at the top, an overarching purpose of the guideline is stated. The purpose is supported by six goals, or groups of requirements, each containing functional requirements, prescriptive requirements, and acceptable solutions for fire safety in tunnels.

Tunnel Fire Safety

An acceptable design can be verified in two different ways: to follow proposed acceptable solution, or alternatively to show that the performance-based requirement is fulfilled. All prescriptive requirements have to be fulfilled. The group has tried to follow the structure of the building rules in this work as strictly as possible. By doing that it is the hope that stakeholders in tunnel safety will recognise the concept, and thereby more easily accept it. The work can be divided into two main parts: The first is specification of requirements and the second is verification.

The purpose of the guideline is in general: to protect life, health, environment, property, and important societal functions. To achieve this purpose six goals have been defined:

- Management: Maintenance, training, emergency, incident and traffic management.
- Prevent the occurrence and spread of fire and smoke.
- Support self-evacuation.
- Support intervention from rescue service.
- Structural integrity.
- Protection from spread of fire to neighbouring structures.

For each goal several prescriptive requirements already exist in laws that have to be fulfilled. For example, the distance between two emergency exits should not be more than 150 meters for longer tunnels. To allow for a performance-based approach, functional requirements are defined. For example a functional requirement for evacuation is to show that road users can evacuate the tunnel under tenable conditions. Acceptable solutions are either taken from previous work or proposed based on expertise and experience.

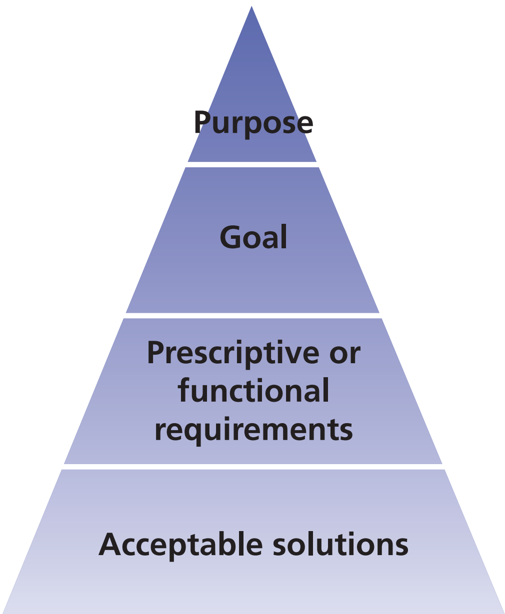


Figure 1. Structure of the tunnel safety guidelines. One overall purpose is achieved through six goals, each having prescriptive or functional requirements defined and pre-specified acceptable solutions

There are three ways to verify compliance with the guideline for tunnel fire safety. First of all, all prescriptive requirements have to be fulfilled. For example, to show compliance with goal number one (management), procedures for maintenance, emergency training and scenario play are mandatory. Secondly, either acceptable solutions are followed or solutions are demonstrated to comply with functional requirements. The guideline is open to different approaches to show compliance through different performance-based methods, however, a recommendation is given specifying one way to show compliance. For example, for the functional requirement, evacuation under tenable conditions, data and background information for verification through scenario analysis is presented.

Another example of a functional requirement is structural integrity. The accepted solution is based on a traditional design methodology in which a specified time-temperature fire curve (HC or RWS depending on tunnel class) is defined which the structure must resist. The functional requirement is that the structure can resist a fire without collapse. A recommended solution is specified in which a more reasonable fire defined by growth rate, maximum heat release rate, and energy content is used to calculate the temperature exposure to the tunnel ceiling. In this sense a more realistic fire exposure is obtained that is relevant to the specific tunnel geometry and ventilation conditions under study.

The guideline is believed to result in safe tunnels where safety and flexibility is ensured through a combination of prescriptive requirements, acceptable solutions and performance-based solutions. IFP

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For further information, go to www.sp.se

Loud and Clear for

The effectiveness of Voice Alarm (VA) systems has been documented in the fire industry for nearly two decades. There is strong evidence that suggests the use of clear voice messages greatly improves response time and provides the opportunity to advise occupants of the safest emergency route.

Simon Foulkes

Gent by Honeywell

Long standing research shows that voice messages are far more effective than tone signals alone and that in an alarm situation, the public take more notice of spoken words than fire alarm bells or sounders. The results from independent research, which studies human behaviour in the event of a fire, showed that only 13 percent of people react in a timely manner to bells. However, in sharp contrast, 75 percent of people react quickly to a voice message explaining the nature of the emergency. Research has also shown that in the event of an alarm, the public generally exit by the entrance and need to be directed to the nearest escape route.

As modern buildings become more complex, the role of the VA has become even more vital to manage the circulation of people safely in an emergency. A spoken message identifies the nature of the problem and gives specific and detailed information to the public. It provides the opportunity to give live messages announcing exact instructions when people are not familiar with the surroundings, and also improves the management of phased evacuation.

Despite this hard and fast evidence that these systems greatly increase response time, installations of VA FDA solutions are still relatively low. In the fire industry today, it is the major projects such as arenas, shopping malls and high-rise buildings that use VA as a matter of course; for general applications and smaller buildings it is far less common. There are several reasons that companies cite for not adopting voice systems and it appears to be largely down to the past absence of real standards covering the systems, and the complexity and lack of knowledge when installing the equipment.

One area of confusion is identifying the difference between a public address (PA) and VA system. Many people believe that to provide a voice message in the event of an emergency like a fire, they simply use their PA system. Unfortunately a PA system on its own, while very good for providing music and messages, is not guaranteed to work when there is an emergency. A large proportion of buildings have reasons to communicate with occupants outside of emergency events, and in applications such as airports or bus stations, PA systems can be critical to the use of the building. PA is also often used to communicate general information in offices, as well as for entertainment and background music, or even spot advertising in retail premises.

A VA system can meet all of these specific communication needs by combining the function of VA with the public address and entertainment system, providing a simple and cost effective solution for both emergency and non-urgent use. A PA/VA system integrated with fire detection, delivers significant economies of scale along with the security of operation associated with a life safety system.

Before any VA system is designed, it is important to understand the appropriate regulations and this is where the British Standard BS5839-8:2008 comes into use, as it clearly defines the requirements of a true VA system. This standard is the code of practice for the design and installation of emergency voice evacuation systems, but up until recently it did not provide manufacturers with any specific guidance on what should be inside their units. The lack of defined guidance in the past posed a particular problem to project managers outside the fire industry who struggled to understand their responsibilities.

The BS5839 Part 8 standard states that a true VA system is a highly secure public address system that includes several features such as monitoring of all internal and external circuits, a number of pre-recorded emergency messages and a monitored secure link to the fire alarm panel. The code sets out all the necessary information needed to design a VA system, and the criteria that needs to be considered to ensure the integrity of the system through the design, installation, commission and maintenance phases.

The absence of real standards was further addressed last year with the introduction of a major new VA standard that came into operation in 2011. The newly harmonised EN54 Part 16 defines the specific functionality of the VA equipment and applies to any component that is part of the core functionality of VA. The rack system is now

Voice Messaging

certified as a complete unit, so the new standard means it is no longer possible to build a system using components from third-party suppliers.

Adding further complexity to the standards and regulations, EN54 Part 24 covers the minimum requirements for loudspeakers and the method for testing their operational performance. Acoustic requirements for loudspeakers vary according the nature of the space where they are installed so many projects may involve at least one application where there is a need to employ specialist design support.

The updated standards mean that VA systems are now subject to similar scrutiny as every other fire alarm system and have to be accredited by an approved testing house before they can be sold. A handful of companies, including Gent by Honeywell, have received this latest certification and their VA products are now fully compliant with the standards.

The three main variations of VA system that are available today consist of standalone voice sounders, central rack amplifier systems and distributed amplifier systems. The system architecture is selected to suit the building and, like all fire detection and alarm solutions, the appropriate system is dependent on the type and size of building they are due to be installed in. The customer requirements are driven by the emergency risk assessment, which would determine the type of system to be used. Before deciding on a VA design the evacuation requirements have to be established; for example, whether the building requires a phased evacuation plan or if the building needs to be evacuated all at once.

Once the evacuation strategy of the building is understood, the designer can then assess the type of VA system that should be used. The level of manual control and the need for live messages versus automated messages drives the decision on the type of system installed. BS5839 Part 8 defines five types of systems from the V1, which is a solution that delivers automatic announcements only, right through to V5 – a fully engineered system. The range of options could include compact solutions, distributed systems or rack built systems.

The choice of system options, coupled with a lack of understanding in acoustics, is another reason that led to many companies choosing standard tone alarms rather than the more effective voice systems. In essence, people tend to avoid them because they do not fully understand the systems. Most VA systems are relatively simple; however specialist knowledge from the manufacturers may be required for specific areas.

Acoustic modelling design is a key part of VA and this is one of the areas that can cause confusion for customers. Selecting the correct loudspeaker can mean the difference between an intelligible announcement and a noise. We have all struggled to understand the muffled announcements at railway stations; the trick is knowing when to spend time and money on experts to get it right. For example, a typical office with low ceilings and low background noise should be fairly straightforward whereas a football stadium or a shopping centre may throw up problems that only a design expert or acoustician can solve.

The main players in VA provide a turnkey solution and will design, supply and commission the systems. Expert knowledge is available to help with everything from acoustic design support and loudspeaker layouts, to design solutions and acoustic modelling. Gent recently set up an additional service team to help its customers by providing expert support in acoustic design. It is important for companies to offer that extra support to customers so they can benefit from the manufacturer's experience in all aspects of VA systems.

Customers may also need additional support during the delivery phase of projects in areas such as rack build, commissioning and factory acceptance testing. This is another element that should encourage more customers to have voice systems installed, as there are a number of fire industry specialists that offer an expert rack build services with a dedicated facility for factory acceptance tests.

Factory acceptance facilities allow a system to be built into the rack so it can then be tested and proved in the factory before it is delivered, rather than having a product that has to be assembled separately by an external specialist. This offers a cost effective and quicker solution that significantly reduces the on-site commissioning because everything, including the configuration, is done in the factory.

The benefits of VA are becoming increasingly apparent to those outside the industry – systems deliver clear, intelligible voice alarm messages as well as orderly phased evacuation in the event of a fire. There is support readily available for customers and the newly harmonised standards clearly define the requirements of a true VA system, so we will no doubt see much more of these highly efficient systems in the not too distant future. IFP

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